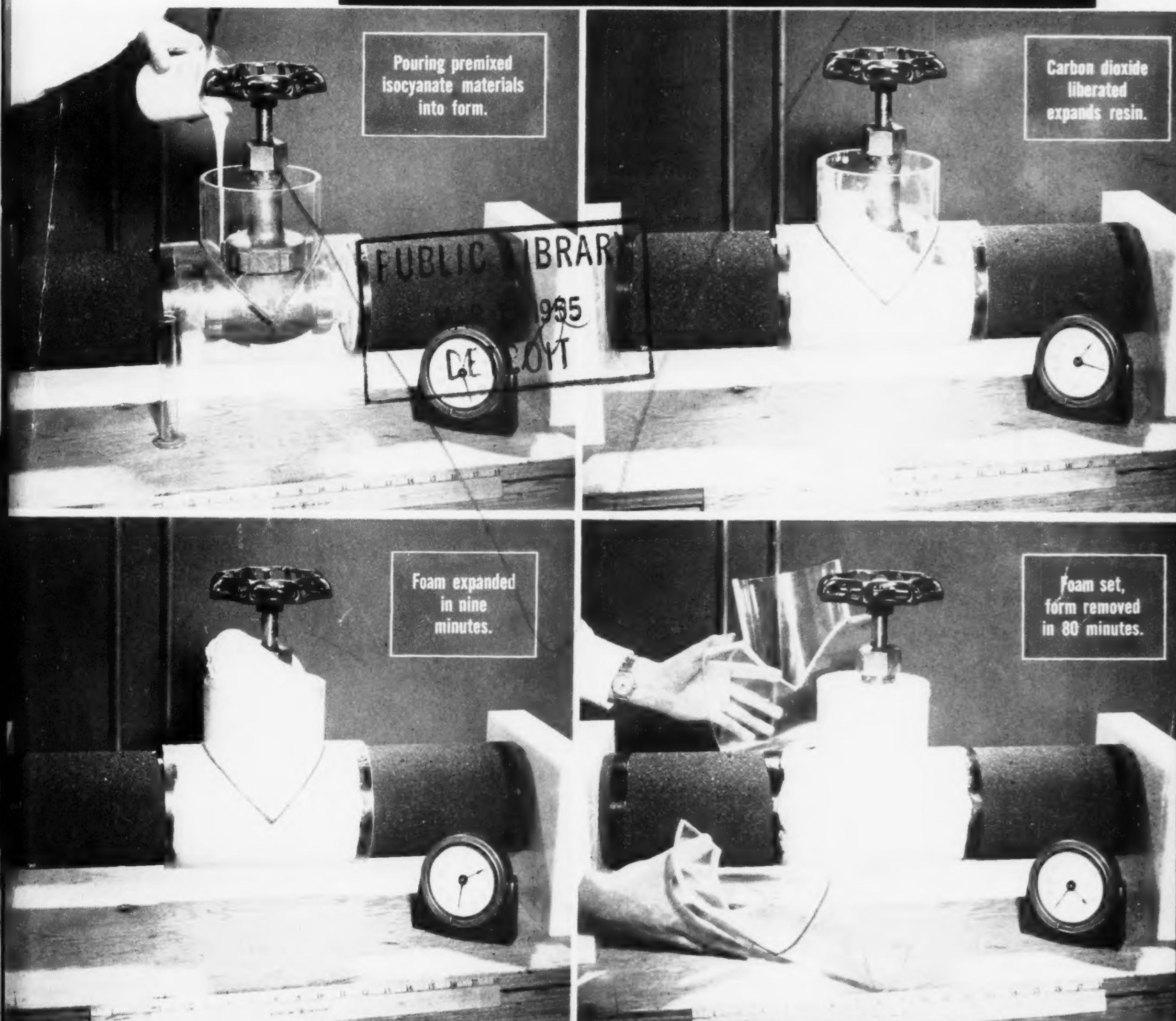
MARCH, 1955

RUBBER WORLD

NOW IN ITS 67th YEAR



A BILL BROTHERS PUBLICATION

ISOCYANATES FOR NEW PROCESSES AND PRODUCTS

see page 765

RUBBER WORLD, March, 1955, Vol. 131, No. 6. Published monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, 1309 Noble Street Philadelphia, Pa., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second Class Matter at the Post Office at Philadelphia, Pa., under the act of March 3, 1879. Subscription United States $5.00 per year; Canada, $6.00; All other countries $7.00 Single Copies, 50 cents. Address Mail to N. Y. Office.

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the nitrile rubber <u>most</u> resistant to oil

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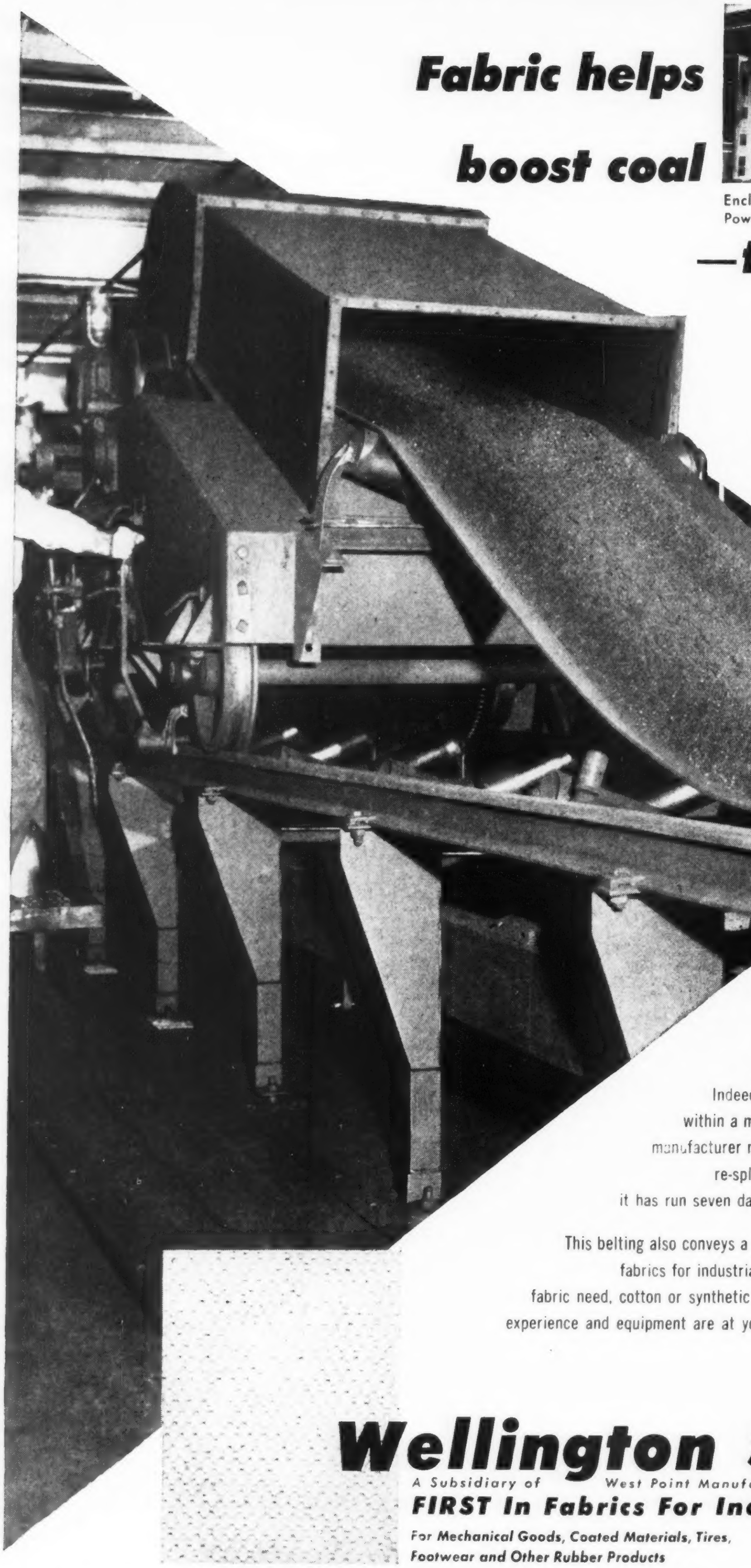
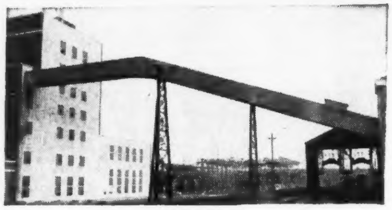


Fabric helps boost coal —to power



Enclosed Hewitt-Robins conveyor belt at Duke Power Company's Lee Steam Station, Pelzer, S. C.

Problem: Boosting a half million tons of coal yearly 365 feet from ground level to bunkers 82 feet high at the Lee Steam Station of Duke Power.

A 36-inch wide conveyor belt was—and is—the answer. Because of the load and inclination, unusual tension develops in the belt. By using a specially constructed Wellington Sears "Shawmut" belt duck, Hewitt-Robins' engineers designed a 763-foot belt that withstands the tension successfully, performs with outstanding efficiency.

This belting has to be extraordinarily strong and durable. It is—carrying up to 500 tons of coal an hour, 425 feet a minute. Indeed, since stoppage would shut the Station down within a matter of hours, the belt is guaranteed by the manufacturer not to stretch excessively and thereby require re-splicing. It has not. Since installation in 1950, it has run seven days a week without being stopped for repairs.

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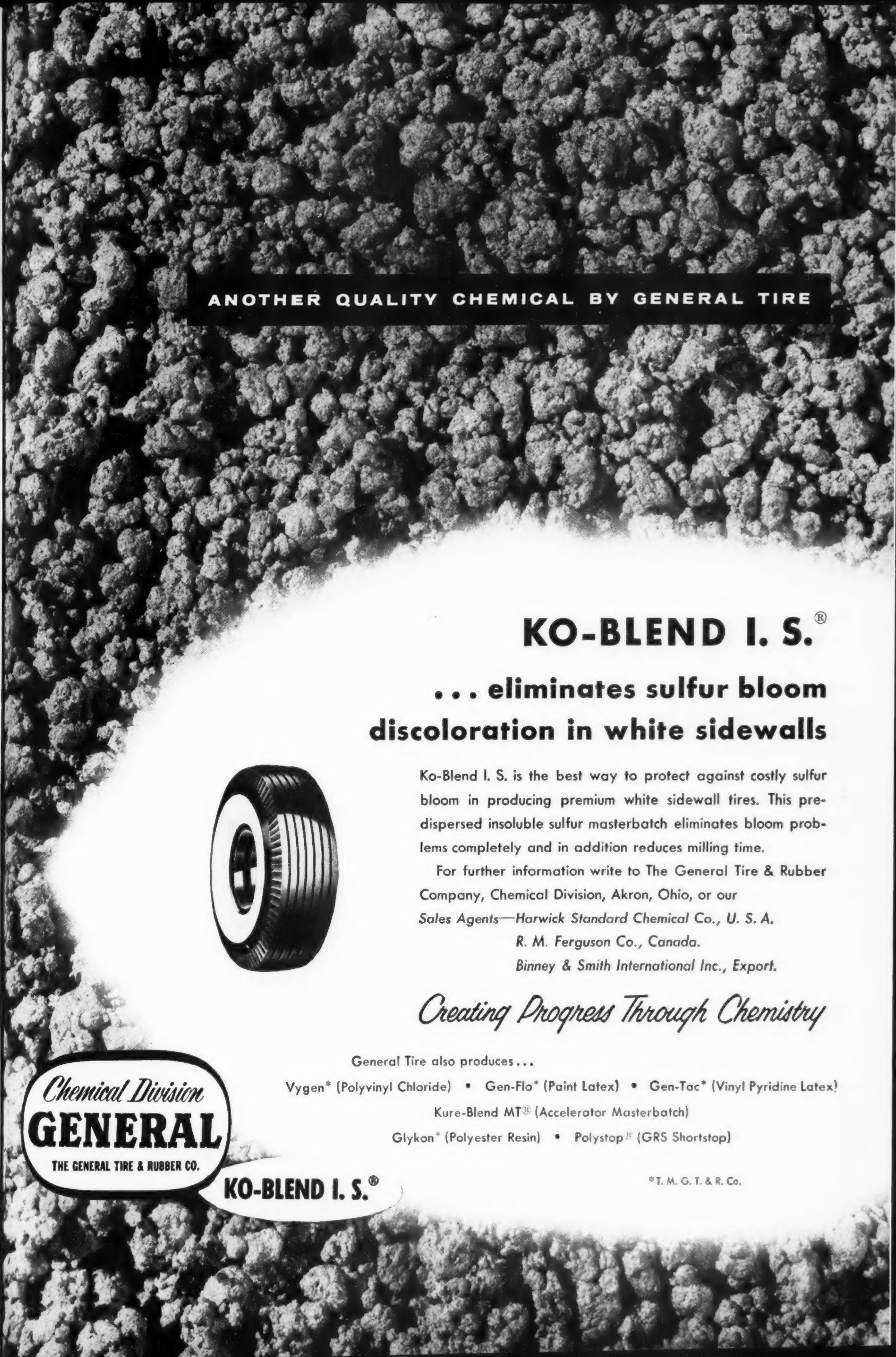
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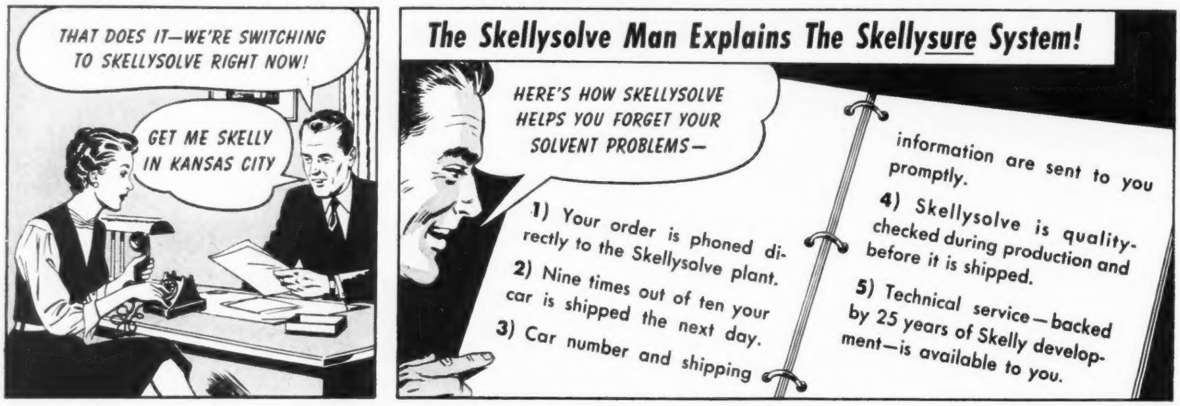
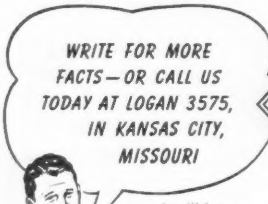


When solvents are so important to your business, why take chances on quality or delivery? Join the companies who are switching to Skellysolve.



Les Weber
Manager Skellysolve Sales

SKELLY

Skellysolve

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Industrial Division
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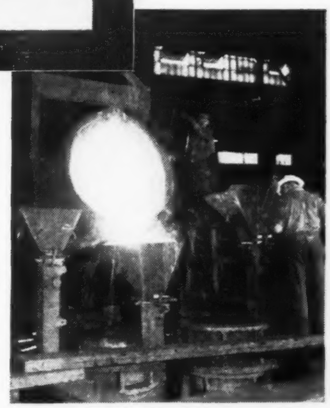
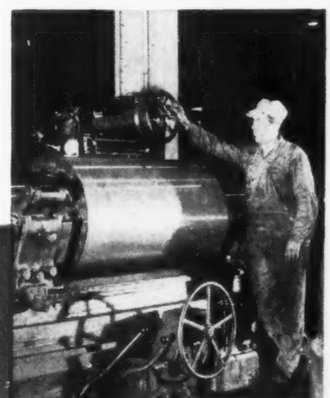


Physical and metallurgical properties of rubber or plastics processing rolls frequently need to be varied to meet special conditions peculiar to the nature of the work to be performed and the requirements of the finished product. That's why the rolls used in Adamson United equipment are custom designed to their specific functions by our own engineers and carefully controlled through every step of manufacture from metallurgical composition to final machining and polishing, in our own roll shops. We have found this precision-minded policy—typical of every phase of Adamson United manufacture—to be our best assurance of customer satisfaction.

Our engineering abilities and plant facilities are available to the industry for the design, construction and installation of all types of rubber or plastics processing equipment.

We invite your correspondence.



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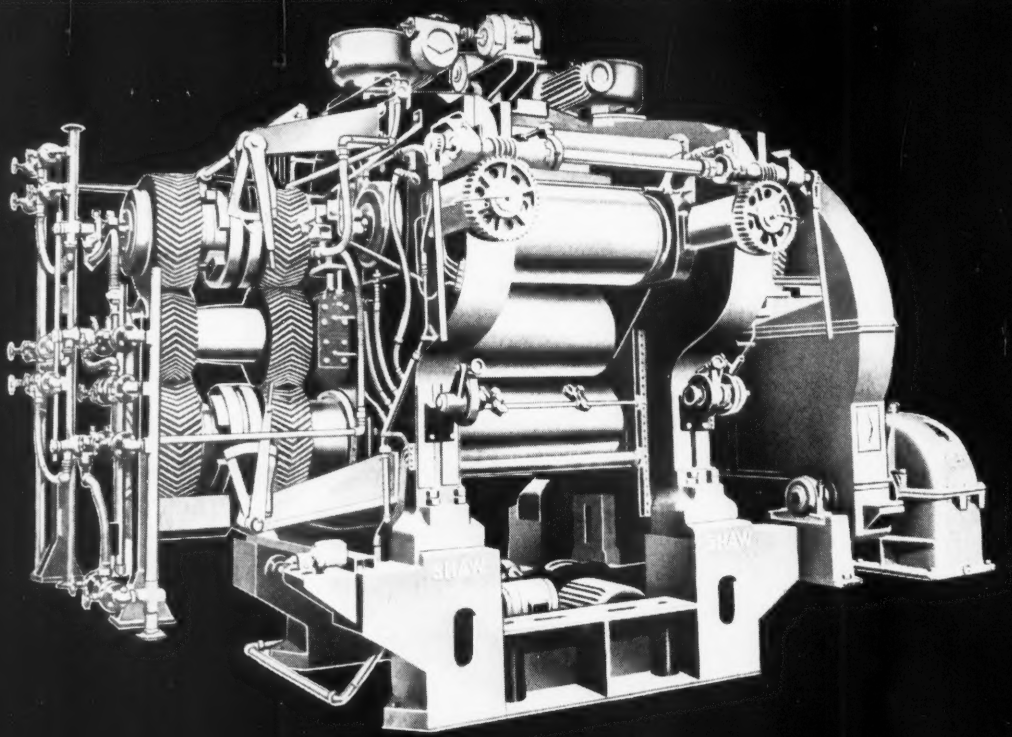
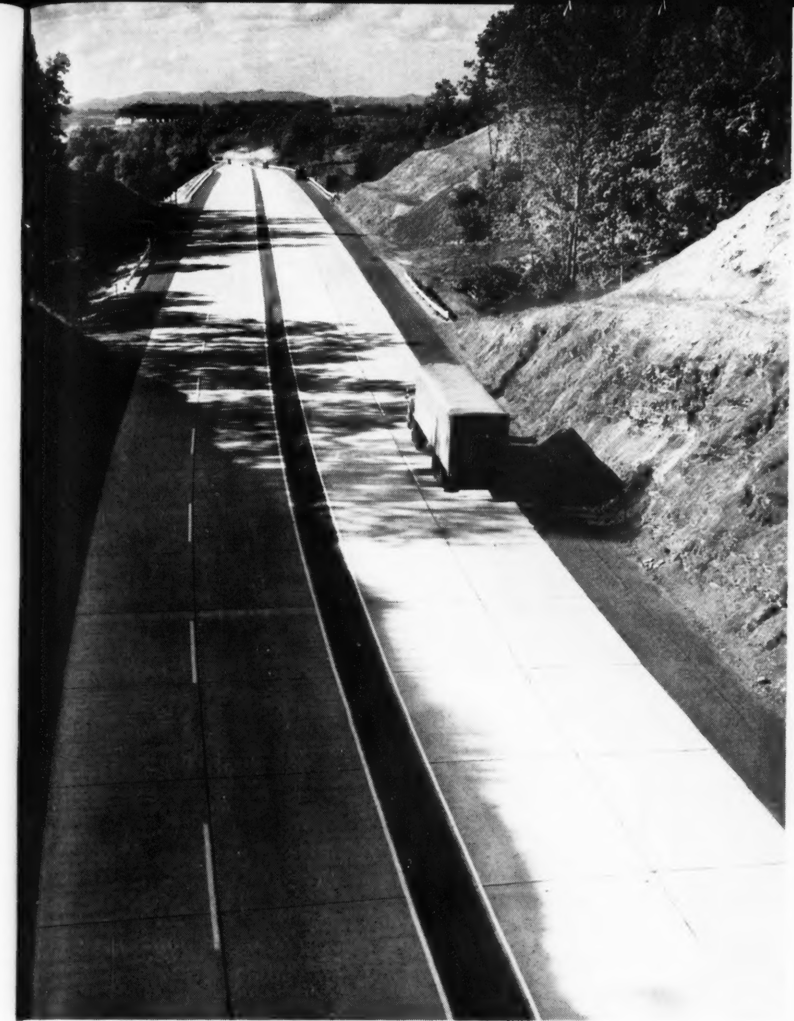
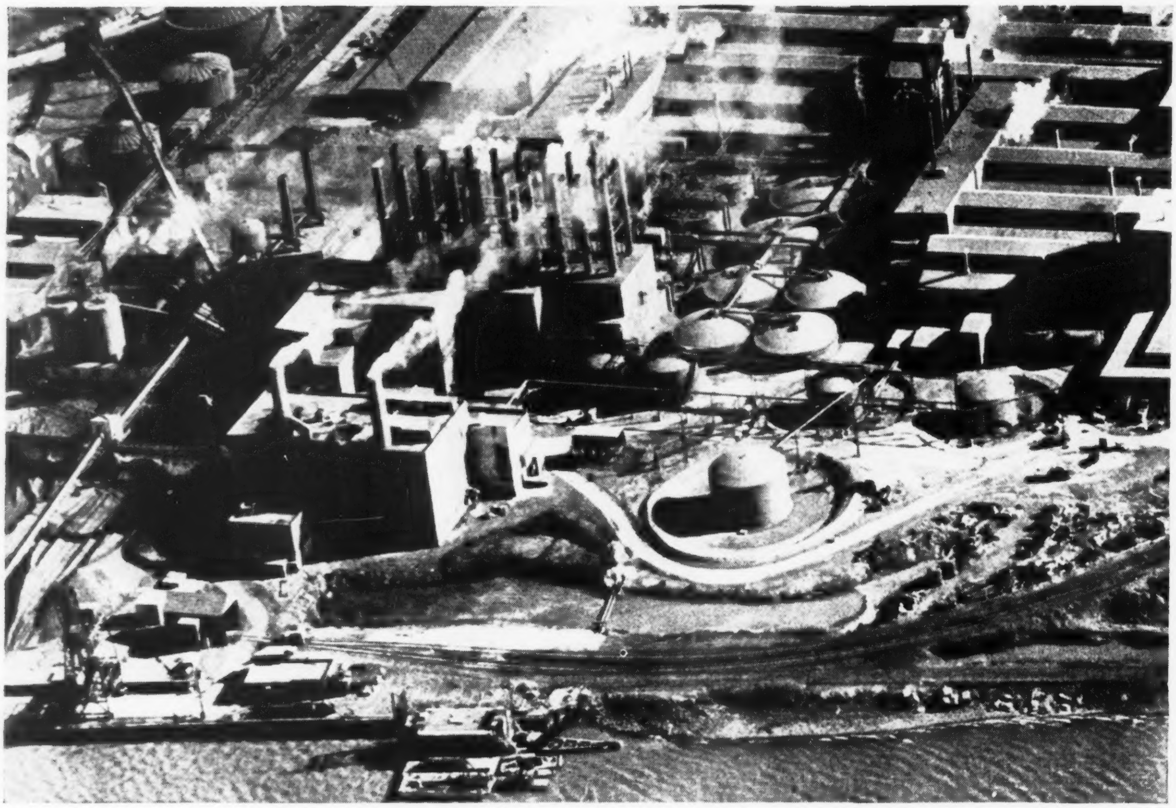




MORRIS ROSENFELD PHOTO



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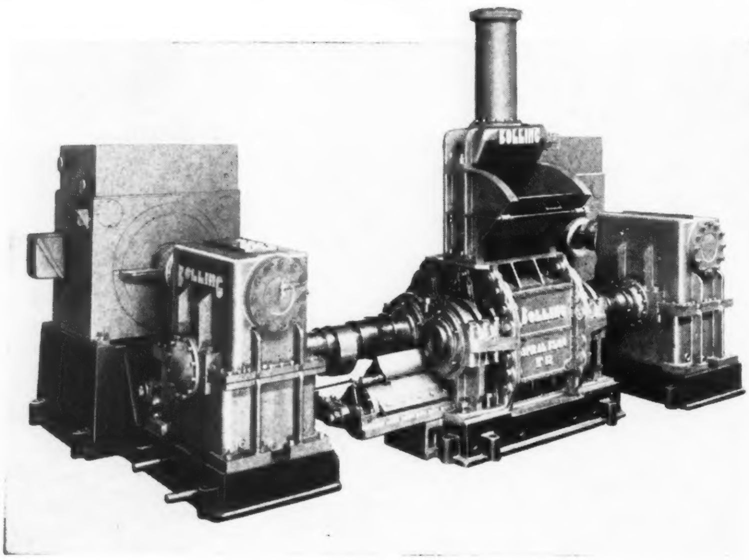

The New No. 12-M Dual Drive up to 500 h. p.
Individual motors on each rotor.

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FOUR PRODUCTION SIZES and a PRACTICAL LABORATORY SIZE . . .
Lower power and lower peaks than you have ever known. Better dispersion and over-all simplicity are self-evident.

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STOP — LOOK — INVESTIGATE!

Can you afford to rebuild a Model "T" when it might have substantial trade-in value on one of these new 1955 models?

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The New No. 4 right-angle compound drive.

STEWART BOLLING & COMPANY, INC.
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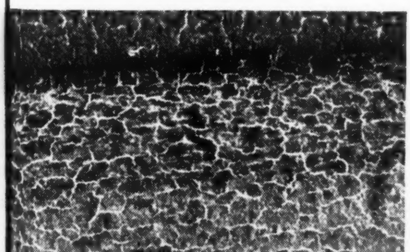
• INTENSIVE MIXERS AND MILLS • CALENDERS • REFINERS • CRACKERS HYDRAULIC PRESSES • PUMP UNITS BALE SLITTERS • SPEED REDUCERS

No sign of checking. The rubber insulation on this wire contains Sunoco Anti-Chek. Compare it with the sample at the right.

Surface checking is clearly evident in the rubber covering of this wire—which does not contain Sunoco Anti-Chek.

STOP SURFACE CHECKING AND CRACKING WITH SUNOCO ANTI-CHEK

Sunoco Anti-Chek keeps black sidewalls smooth... even after prolonged storage.



Notice the cracking and checking of the sidewall on this tire which does not contain Sunoco Anti-Chek.

Sunoco Anti-Chek is unique . . . there's no other anti-checking wax like it. It's a narrow-cut primary product, not a blend. It is completely controlled from crude oil to finished product by the same company that originally developed it. And it is made in the most flexible wax plant in the world. To you this means a completely uniform product that can be depended on for the same excellent results tomorrow, next year, 10 years from now!

Detailed information on the many advantages of Sunoco Anti-Chek is given in a new technical bulletin. To get a copy, call your Sun Oil Company representative or write Dept. RW-3.

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for as little as
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in one swift operation!
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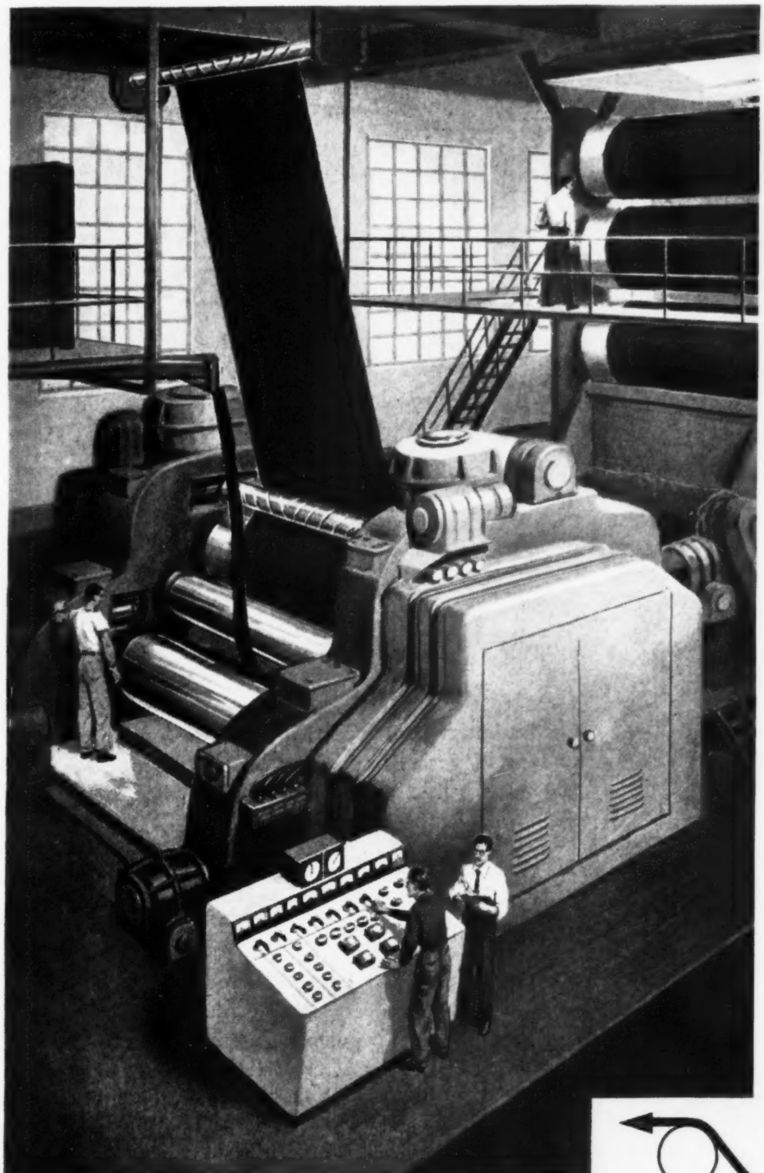
How you can double-coat 80 miles of tire fabric a day---*evenly*---*accurately*



The giant "Z" calender* you see in operation at the left, was designed by Farrel-Birmingham for a production speed of 100 yards per minute. That means this machine can double-coat 80 miles of tire fabric in 24 hours.

More important is the calender's ability to apply rubber coating evenly to both sides at the same time and across the full width of the fabric, under constant weight and tension, with unmatched uniformity.

To provide this accuracy, both the upper and lower roll pairs of the calender are equipped with motorized crossed-axes devices for fine adjustment of roll "crown." Roll adjustment by individual motor for each screw of the three adjustable rolls permits extremely precise settings. Hydraulic pullbacks hold the rolls in positive operating position.

Double-coating of tire fabric is just one of the jobs in which F-B "Z" calenders are establishing new standards for accuracy. They are equally outstanding for the high-speed production of rubber and plastic film and sheet and for single coating. Send for more information on the revolutionary "Z" calender.

FARREL-BIRMINGHAM COMPANY, INC.
Ansonia, Connecticut
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Fayetteville (N. C.), Los Angeles, Houston

FB-993

*The "Z" calender is an original development of Farrel-Birmingham Company, Inc. When you think of the "Z" calender you are thinking of Farrel-Birmingham.

Flow of stock and fabric in double-coating operation.

F-B PRODUCTION UNITS

Farrel-Birmingham

Banbury Mixers • Plasticators • Pelletizers • Extruders • Calenders • Mixing, Grinding, Warming and Sheeting Mills • Refiners • Crackers • Washers • Hose Machines • Bale Cutters • Hydraulic Presses and Other Equipment for Processing Rubber and Plastic Materials.

FOR MAXIMUM
SUN-CHECKING PROTECTION
Specify Original Formula

"ANTISUN"*

by
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*Registered Trade Mark

Maximum protection against sun-checking over extended periods can only be guaranteed when a top-notch sun-checking agent is employed.

Cary "Antisun",

formulated of the finest quality ingredients and proven so satisfactory, in tire compounding, mechanical goods, insulated wire and cable compounds, is still the same basic formula developed by our President years ago.

No variations or substitutions have been made. ANTISUN is still the finest of sun-checking agents.

Accept no substitute for this time-tested, highest quality product — CARY "ANTISUN".

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- Low Cost.
- Available in convenient chipped or slabbed forms.

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- High Melting Point Synthetic Waxes
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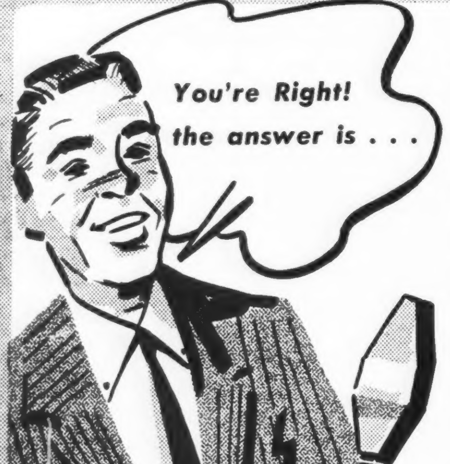
Canadian Representative: Lewis Specialties, Ltd., 1179 Decarie Blvd., Montreal 9, Que.

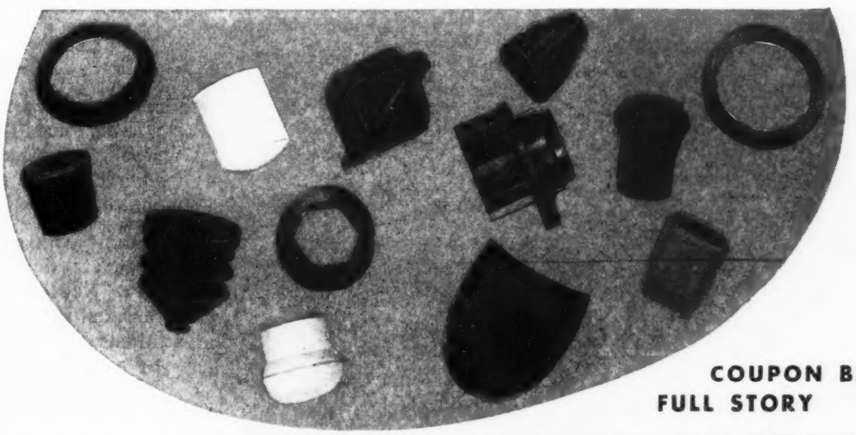


You're Right!
the answer is . . .

New LIQUIMATIC Rubber Tumbling Barrel
- Stainless steel lining, 3" Rubatex insulation.
- Uses either liquid CO_2 or Dry Ice.
- Heavy duty construction throughout.
- Automatic control of time and temperature down to -100° F.

NO ROUGH STUFF!

Want smooth, flashing-free rubber products? Want them in less time, at lower cost? Then *you* need the new LIQUIMATIC CO_2 Rubber Tumbling Barrel. Wholly new in design and operation—it's the most efficient machine of its kind ever made. Engineered and manufactured by The LIQUID CARBONIC Corporation—world's largest producer of CO_2.



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Liquid

RED DIAMOND CO_2 . . .
Solid (Dry Ice) or Liquid

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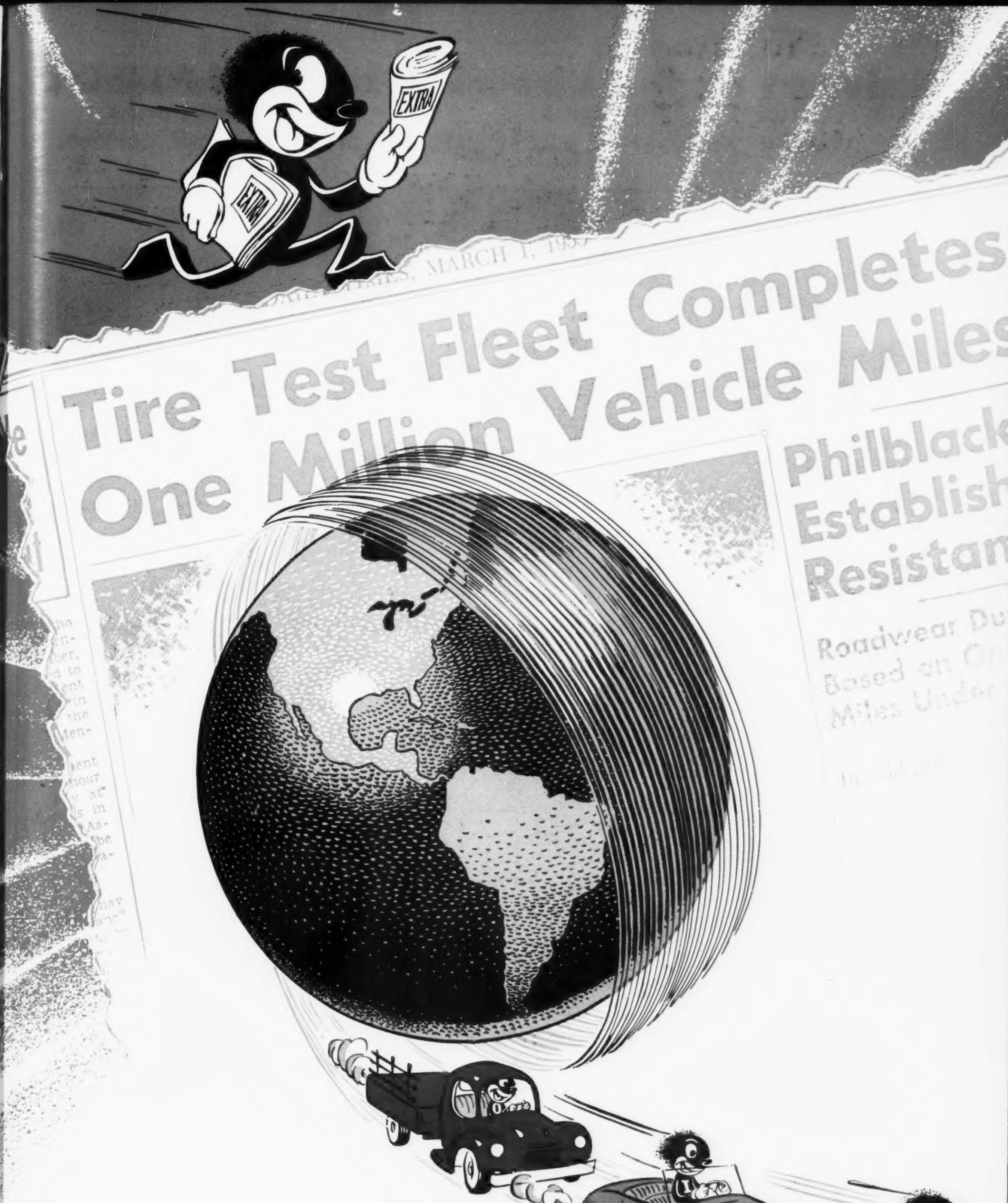
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Philblack
Establish
Resistan
Roadwear Du
Cars and trucks travel equivalent
of 40 times around the world to
establish comparative wear resistance of
Philblack O · Philblack I · Philblack E
in cold rubber and natural rubber tire treads.

Roadwear Durability Index

based on one million test vehicle miles under closely supervised conditions

In cold rubber treads

Philblack O is equal to or superior to competitive HAF Blacks.

Philblack I compares favorably with competitive ISAF Blacks.

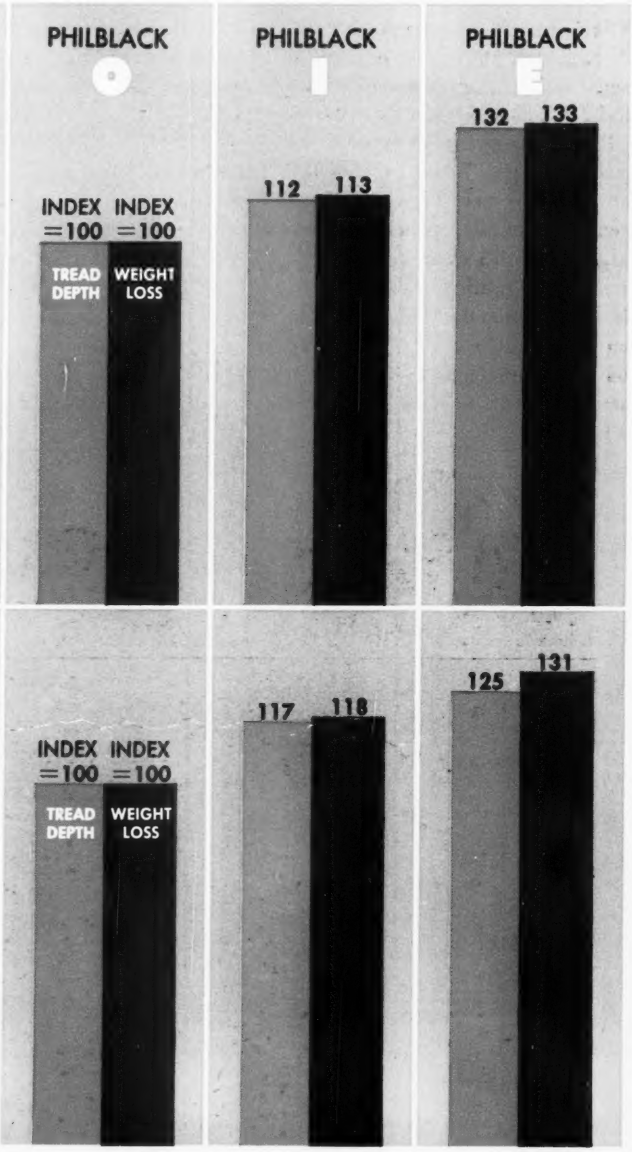
Philblack E topped all other blacks in resisting road wear.

No tread cracking was experienced with any of the Philblacks — O, I or E.

In natural rubber treads

The advantages of Philblack I and Philblack E in natural rubber treads can readily be seen in these roadwear results.

Philblack E is notable for the resistance it imparts to chunking, tread cracking, and to cut and crack growth.



Get the full story on the Philblacks. Our long experience with elastomers and carbon black is at your service. Consult your Philblack Technical Representative.

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- Light Calcined Magnesia
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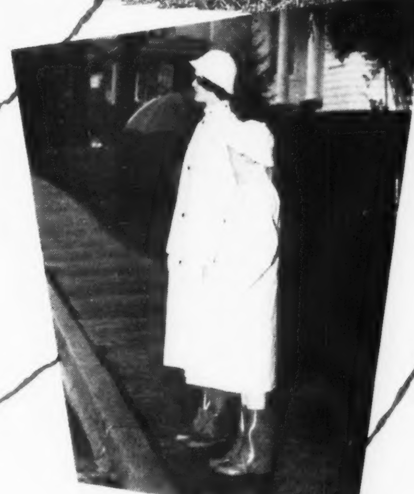
For Improved Results in *ALL* NEOPRENE APPLICATIONS



GENMAG Technical Calcined Magnesias are high purity, lump-form magnesias specifically developed for Neoprene compounding. They deliver all required properties unimpaired and assure excellent dispersion. They are packed to keep those properties at the highest peak and thus provide BETTER RESULTS in all Neoprene applications . . . Two recommended grades give maximum versatility in meeting such compounding requirements as scorch resistance, acid acceptance, color and cost range . . . Of course, there are other grades available to meet any type compounding need.

OTHER IMPORTANT USES, TOO . . .

Applications of GENMAG Technical Magnesias are suggested in such products as: Casein cement, fluorescent tube coating, gas-tight cements for electrical equipment, reagent for powdered oils, filler for artificial leather, dental compositions, pigment and extender for paints and varnishes, textile sizing, plastics reactant and filler — and many others . . .

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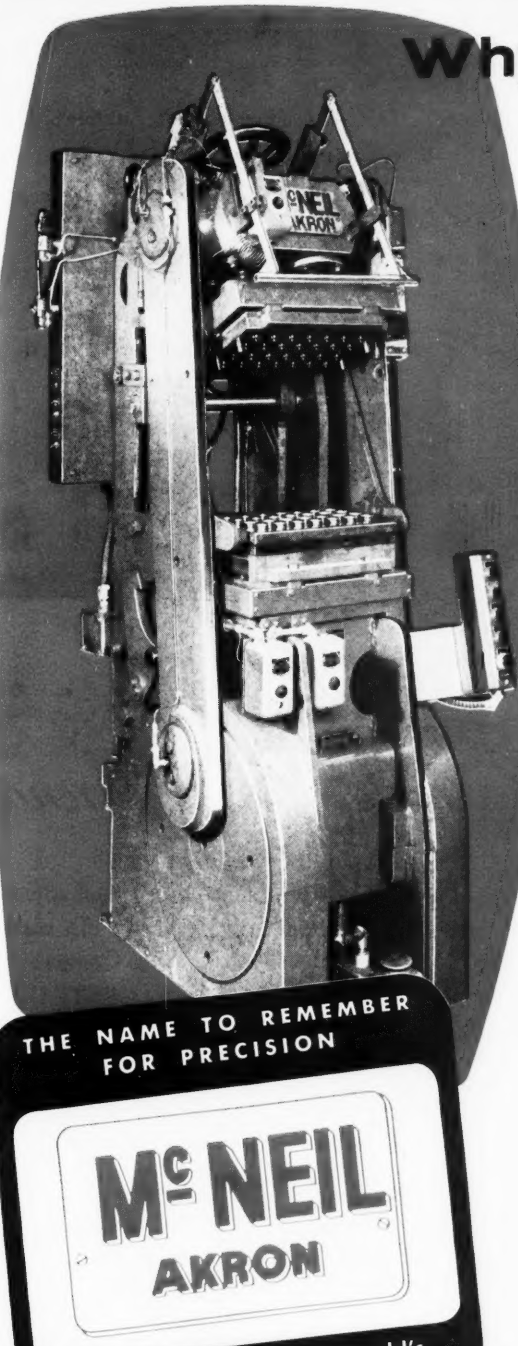

Why the New McNEIL-AKRON "BANTAM"

Speeds Mechanical Goods Production . . . Cuts Mechanical Goods Cost

Enthusiastic owners of the new McNeil-Akron Model 150-10x16 Press — the BANTAM — report it is "really something to crow about!"

As proud parents, may we modestly say this about our new 'baby':

THE BANTAM IS COMPACT — Overall measurements are 26½" x 44" x 5'10" closed or 6'10" open. Requires only 8 sq. ft. of floor space. Perfect for manufacturers not requiring the volume production of our larger presses . . . and for crowded press rooms.

THE BANTAM IS FAST, EFFICIENT — Small though it is, the BANTAM is nevertheless a high production unit. Designed especially for speedy transfer molding of small, intricate and close-tolerance parts, it is in keeping with today's trend toward the use of smaller molds in greater number. Handles 2-, 3- and 4-plate molds automatically. And because everything is handled mechanically, hand work is eliminated and mold maintenance costs are slashed!

THE BANTAM IS DEPENDABLE — Built to McNeil PRECISION standards, it is maintenance-free as only a McNeil can be.

THE BANTAM IS VERSATILE — It can do a lot of jobs within the limits of its maximums of 1000-lb. per sq. in. platen pressure and of 400° F. temperature in its electrically heated platens. What's more, it has an automatic, adjustable knockout mechanism that provides new latitude to mold design.

THE BANTAM IS A MONEY-MAKER — Low in original cost, it is economical to buy, to own and operate. It will quickly pay for itself in profitable production.

WRITE OR WIRE TODAY for complete information.

Manufacturing Agents: Great Britain—Francis Shaw & Co., Ltd., Manchester, England; Australia and New Zealand — Vickers-Ruwolt Proprietary, Ltd., Victoria, Australia.

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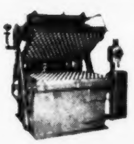
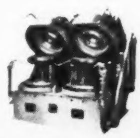
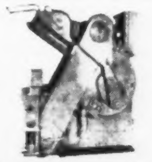
McNEIL AKRON

Manufacturers of the World's Finest Rubber Curing Equipment







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96 East Crosier St. Akron 11, Ohio

Rubber Working Machinery — Individual Curing Equipment for Rubber Products

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VOLUME 131 • NUMBER 6 • MARCH, 1955

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MARKET REVIEWS

Cover photograph courtesy of Du Pont.

RUBBER WORLD

MARCH, 1955

Isocyanates and Their Reaction Products[1]

By H. Herman Abernathy[2]

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Diisocyanates react with water to form carbon dioxide and polyureas and with polyhydroxy resins to form polymers which may be hard and tough, or soft and plastic, or elastic. The two reactions may be combined to produce cellular counterparts of the solid materials.

Among the potential applications for the rigid and semi-rigid foams are those as structural reinforcing materials.

The resilient foam has many properties equal to or better than those of latex foamed rubber, with which it is considered to be competitive.

The polyurethane rubber has excellent physical properties including resistance to oils and solvents and is outstanding for its abrasion resistance.

Contrary to a widely accepted notion, isocyanates are not new. While this highly reactive family of chemicals has remained relatively obscure until recent times, chemists have been using them for years in organic syntheses.

Actually, the role of isocyanates in polymer chemistry dates back to the 1930s, stemming from the same broad program of fundamental high polymer research that produced nylon and neoprene. Hanford, Holmes, Rothrock, and other du Pont researchers found that polyisocyanates were excellent building blocks by virtue of their ability to react with large molecules containing active hydrogen. They obtained a number of basic patents in this field.

Structural formulae and physical form of four diisocyanates now commercially available in this country are shown in Figure 1. In addition to these, mixtures of the 2,4 and 2,6 isomers of toluene diisocyanate are also available. Methylene bis (4-phenyl isocyanate) is available not only as the technical material, but also as a 50% solution in solvent. The first two materials shown are liquids at room temperature; while the last two are solids. All four are aromatic diisocyanates. The aliphatics are generally more toxic and more expensive. In handling isocyanates it is necessary to protect them from moisture or other materials containing active hydrogen.

The question of health hazards has been widely discussed, and a number of toxicological studies have been made. The picture concerning dermatitic and pathological properties is still not complete, but enough is known to dictate that these materials be handled with great care, and that protection from vapors be provided.

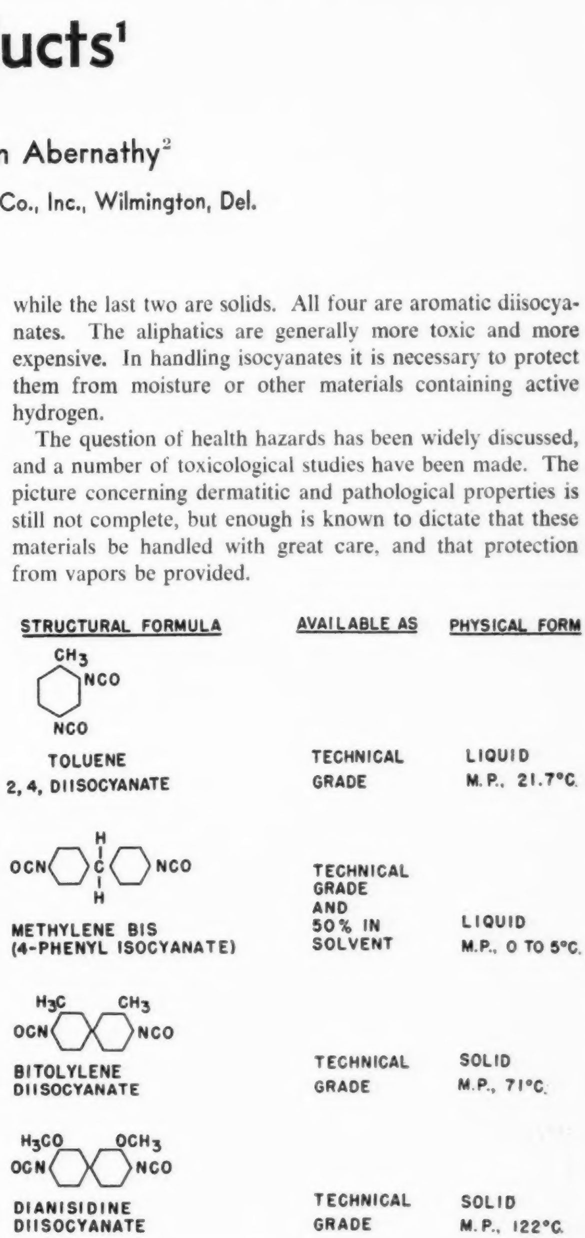

Fig. 1. Commercially available diisocyanates

[1] Presented before the Detroit Rubber & Plastics Group, Oct. 8, 1954.
[2] Technical sales manager, Rubber Chemicals Division at Du Pont.

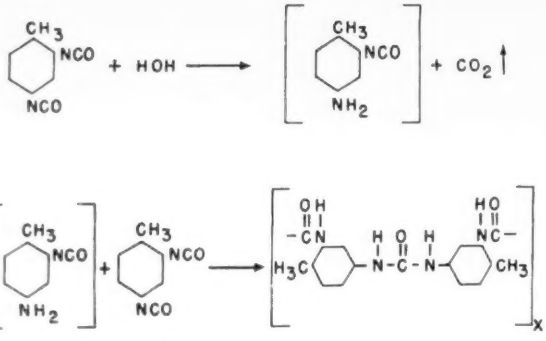

Fig. 2. Reaction of diisocyantes with water

Diisocyanate Reactions

Diisocyanates will react with alkyd resins, other polyols, water, ureas, urethanes, amines—and virtually any other compound containing active hydrogen—to form a wide variety of solid or cellular products.

Figure 2 shows the reaction of water with toluene 2,4 diisocyanate. This reaction is particularly important in making cellular products, as it provides a source of gas. The two principal products of the reaction are carbon dioxide and polyureas. Since the ortho-NCO group in toluene 2,4 diisocyanate is much less reactive than the para, with care it is possible to control the reaction so that only one unit is obtained. Generally, however, the major product is a mixture of polyureas, formed when the ortho-NCO group reacts. Polymer formation is further encouraged through reaction of NCO groups with the urea hydrogens to form biurets. The reaction to form biurets is a great deal slower than the reaction occurring between NCO groups and intermediate NH_2 groups. With diisocyanates such as methylene bis (4-phenyl isocyanate), where both NCO groups are of equal reactivity, "single unit" ureas cannot be obtained.

Reaction rate with water is greatly speeded by bases. In fact, with strong fixed alkalies it may go with almost explosive violence. Weak acids retard the rate somewhat. In practice, for making cellular products, mildly basic materials are generally used as catalysts.

Figure 2 also illustrates the value of differential reactivity between the isocyanate groups of a material such as toluene 2,4 diisocyanate. This property provides one way of controlling polymer structure.

Figure 3 illustrates the reaction of toluene 2,4 diisocyanate with a glycol. The glycol is shown schematically; in practice it is usually a hydroxyl-terminated polyester. It may, of course, be any one of a variety of polyfunctional hydroxylated materials, or perhaps a simple glycol such as ethylene glycol.

The top arrow indicates what may occur when a large excess of diisocyanate is used. Although only one product is shown, there is always some polymer formation, due either to reaction of the ortho-NCO groups with glycol, or to reaction of NCO groups with the urethane hydrogen. The major reason for showing only one product is that both the ortho-NCO reaction and the urethane hydrogen reaction (particularly the latter) are slower than the reaction of para NCO groups with the hydroxyls. If less than about 100% excess NCO is used, the major product will be polymer.

When excess hydroxyls are present, the major product is polymeric; the molecular weight depends on a number of factors, including the type of catalysts used, the choice of polyhydroxy material, and the temperature of the reaction.

If a 1:1 mol ratio of reactants is used, the product will theoretically be an infinitely long chain. This is never attained because of steric factors, including chain branching and cross-linking due to reaction of the urethane hydrogens.

These three cases serve to demonstrate some of the many variables involved in the preparation of polyurethane polymers and point up the necessity of careful control of reactants and reaction conditions if a uniform product is to result. They also illustrate that a very wide range of products can be obtained by varying raw materials, reaction conditions, and mol ratios.

Concerning selection of materials and reaction conditions for the preparation of polyurethane products, the following broad statements can be made.

First, in making cellular products the polyureas derived directly from the diisocyanates and water are generally unsuitable for foams, as they are likely to be brittle and powdery. On the other hand, the products derived from hydroxylated materials, such as alkyd resins and diisocyanates, have much better physical properties. As a consequence, cellular products are usually made by reacting alkyds and polyisocyanates in the presence of enough water and excess NCO to give the desired amount of gas.

The reactions may be run all at once by simply mixing alkyd resin, diisocyanate, and water in the proper proportions, but better control is effected if the resin is first reacted with the isocyanate to make a "prepolymer" containing excess NCO groups. This is then reacted with water to produce foam. Catalysts may or may not be used. There are, of course, many variations of these techniques.

A second general statement concerns the choice of resin. If a hard, tough product, either cellular or solid, is wanted, relatively low molecular weight hydroxy compounds may be chosen as raw materials. This choice should give more opportunity for cross-linking and toughness by virtue of the increased number of urethane hydrogens available. Cross-linking sites to produce toughness or hardness may alse be provided by increasing the functionality of the hydroxy com-

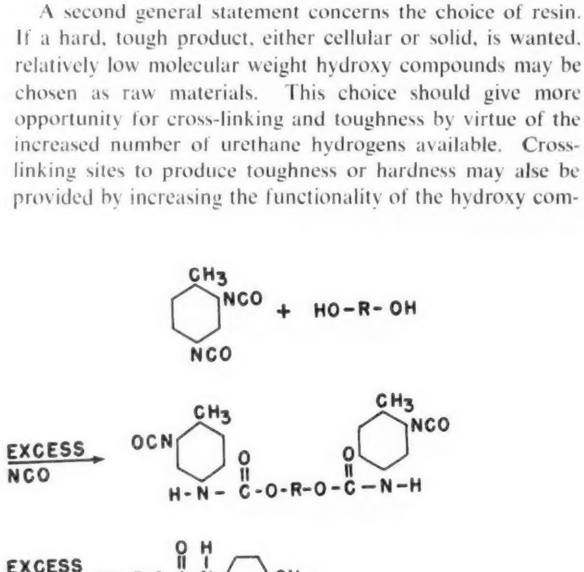

Fig. 3. Reaction of diisocyanates with glycols

pound or the isocyanate. Still another method is to introduce urea groups by including either water or amines in the starting resin. This favors cross-linking because urea hydrogens usually react with NCO groups faster than urethane hydrogens.

If the goal is softer, more plastic products, or elastomers, fewer cross-links are needed along the chain. This can be accomplished by using a dihydroxy raw material of relatively high molecular weight, making the distance between the OH groups large and reducing the number of urethane hydrogens available as cross-linking sites.

In some cases polyurethane products may be treated with additional diisocyanate to produce cure or vulcanization.

Present and Future Products

A variety of end-products has been produced experimentally with such reactions in du Pont laboratories. While many of these may not be available commercially for some time, they serve to illustrate the versatility of the reactions and the outstanding physical properties that can be obtained.

Dense Rigid Foam

Table 1 shows the properties of a dense, rigid, cellular product made by reacting a trihydroxy resin with excess toluene 2,4 diisocyanate and then adding water to cause foaming and setting. In this case rigidity was obtained by increasing the functionality of the starting material from the two present in glycols to three.

The product has a density of 20 pounds per cubic foot. It is strong and tough and has some ability to recover from deformation. It is not brittle and has very good resistance to shock and vibration. In addition, the foam has good thermal insulating properties and does not support combustion. Like many other polyurethane products, it has very good resistance to oxidation. It does soften at about 100° C., which characteristic limits its usefulness to a certain degree. A product of this type should make an excellent structural material, particularly where high strength and reinforcement are needed.

Semi-Rigid Foam

Table 2 lists some of the properties of a low-density polyurethane foam made from essentially the same raw material as the high-density foam, but containing additional water and isocyanate to increase gas formation. While its strength is considerably lower than that of the 20-pound foam, the lightweight product still has very respectable strength and

TABLE 1. PHYSICAL PROPERTIES OF DENSE RIGID FOAM

Density—lbs. per cu. ft.	20
Tensile strength	
Yield—psi.	250
Ultimate—psi.	350
Elongation	
Yield—%	2.3
Ultimate—%	6.5
Compressive strength	
Yield—psi.	300
50% deformation—psi.	600
Elastic modulus—psi	9500
Shear strength	
Ultimate—psi.	215
Elastic modulus—psi.	615

TABLE 2. PHYSICAL PROPERTIES OF SEMI-RIGID FOAM

Density—lbs. per cu. ft.	1.7-2.0
Tensile strength	
Yield—psi.	3.5
Ultimate—psi.	18
Elastic modulus—psi.	300
Elongation	
Yield—%	2.5
Ultimate—%	15
Compressive strength	
Yield—psi.	4
Ultimate—psi.	9
Shear strength	
Ultimate—psi.	10
Flexural strength	
Yield—psi.	10
Elastic modulus—psi.	1000
Deflection at yield—%	20-30
Thermal conductivity	
K—btu./hr./sq. ft./in./°F (at 75° F)	0.21
Sound absorption coefficient (cut section)	
Sound frequency	
250 cps.	0.79
500 cps.	0.99
1000 cps.	0.97
Electrical properties	
Dissipation factor at 1000 cps. (1/2-in. section)	0.002
Dielectric constant at 1000 cps.	2.24
Resistivity—ohm.-cm.	6.8×10^{11}

enough ability to elongate or compress before rupture to produce good resistance to shock and vibration. Like the heavier foam, it does not support combustion and has good oxidation resistance.

Thermal conductivity, moreover, is low; sound absorbing ability is high, and electrical properties are good. Flexural strength, while not high in absolute terms, is surprisingly good for such a lightweight product.

In addition to the good physical and chemical properties of these foams, both offer outstanding advantages in ease of application. They can be foamed in place at room temperature in complicated cavities and will adhere tightly to various metals, wood, glass, and fabrics, making it possible to prepare strong monolithic assemblies without the application of external heat. Spreading and spraying techniques may also be used.

With the remarkable combination of physical and application properties they display, these foams should be almost ideal for insulating complicated assemblies or odd-shaped equipment, and for preparation of a wide variety of panels and other structural members. Their adhesive qualities would simplify assembly, thus reducing cost.

Resilient Foam

Probably one of the most attractive potential uses for polyurethanes is in the field of resilient foam. Table 3 compares the properties of a resilient polyurethane foam with those of commercial 60/40 natural rubber-GR-S latex foam. The polyurethane foam at three pounds per cubic foot density has a load-carrying capacity better than that of natural rubber-GR-S foam at six pounds per cubic foot. While natural rubber-GR-S foam is somewhat superior in resistance to set at elevated temperatures, the polyurethane foam has high tensile strength. In addition, the polyurethane foam does not support combustion.

The excellent ozone, oxygen, and flex resistance of polyurethane resilient foam are outlined in Table 4.

That resilient polyurethane foam is oil resistant is borne

out by data in Table 5; the foam retains most of its strength after 24 hours at 70° C. in ASTM No. 3 oil, as well as after 24 hours at room temperature in ASTM fuels A or B. There is, of course, some swelling, but little permanent damage. Resistance to water at room temperature is very good, but the foam cannot tolerate continuous boiling in water.

Their high load-carrying capacity at low density, excellent aging properties, and ability to be formed at room temperature make the resilient foams outstanding candidates for the cushioning field.

Urethane Rubber

Another polyurethane product having an excellent chance for commercial success is urethane rubber. Table 6 outlines some of the properties of an experimental product called "Adiprene" B urethane rubber. This product is still in the laboratory stages of development, and samples are not yet available. A brief description of its properties may illustrate, however, the reasons for predicting commercialization of urethane rubbers.

Strength properties and resistance to solvents are also shown in Table 6. The rubber is very strong, resilient, has high modulus and hardness, and can be classified as an oil-resistant elastomer. Resistance to tearing is very good, and the urethane rubber retains its physical properties very well at 70° C.

The data in Table 6 show that the urethane rubber also retains its physical properties well during accelerated aging. It is resistant to both heat and oxidation and, in black stocks, has excellent resistance to weathering. Exposure to water at elevated temperatures results in some degradation, but the process is very slow.

This particular urethane rubber performs well at low temperatures, being similar to natural rubber or GR-S in this respect. It has a very low brittle point. The temperature retraction data show that while it stiffens considerably at very low temperatures, it regains flexibility promptly on warming. The data are not shown here, but if Young's modulus is determined at low temperatures, there is a sharp rise in the modulus value between —40° F. and —60° F. This may indicate the lower limit of serviceability of unplasticized stocks.

The outstanding characteristics of urethane rubbers is abrasion resistance. Actual tread wear data confirms this statement.

A tire was recapped with "Adiprene" B; the tread was applied to a buffed, cured carcass with the aid of a special adhesive system. It was then cured in a conventional recapping mold and road-tested. It has been run 20,000 miles, mostly at 60 miles per hour, and shows approximately half the rate of wear of a first-line GR-S treaded tire of the same size and design. With this kind of performance, urethane rubbers will undoubtedly become important additions to our list of elastomeric raw materials.

Summary and Conclusions

A review of the chemistry of isocyanates shows that the diisocyanates react with water to form carbon dioxide and polyureas. They react with polyhydroxy resins to form high molecular weight polymers which may be hard and tough, or soft and plastic, or elastic. The two reactions may be combined to produce cellular counterparts of the solid materials.

Among the end-products that have been produced experimentally is a dense, rigid, cellular product that is strong,

TABLE 3. PROPERTIES OF NATURAL RUBBER AND POLYURETHANE FLEXIBLE FOAMS

	60/40 Nat. Rub./GR-S	Polyurethane
Density—lbs./cu. ft.	6	3
Tensile strength—psi.	17	25
Elongation—%	375	200
Compression/deflection		
Psi. to 25% comp.	0.42	1
Compression set, 22 hrs. at		
70° C—%	4.6	10-20
25° C—%	4.1	3.5
Flame resistance	Burns	Does not support combustion

TABLE 4. PHYSICAL PROPERTIES OF A POLYURETHANE FLEXIBLE FOAM

	Tensile Strength Psi.	Elongation %	Comp./Defl. Psi. to 25% Comp.
Ozone resistance (at 100 ppm.)			
Original	24.6	262	0.6
After 8 hrs.	14.5	238	0.4
Oxygen bomb			
Original	24.6	262	0.6
After 28 days	19	218	0.6

	Comp./Defl. Psi. to 25% Comp.
Flex resistance	
Original	0.6
After 100,000 flexes	0.68
200,000 flexes	0.69

TABLE 5. PHYSICAL PROPERTIES OF A POLYURETHANE FLEXIBLE FOAM

Solvent resistance	Tensile Strength-Psi.	Elongation %
Original	24.6	262
24 hrs./70° C. ASTM No. 3 Oil	24	242
25° C. fuel A	22.5	255
B	22.5	238
Water resistance		
Original	24.6	262
24 hrs./100° C.	17.5	270

TABLE 6. EXPERIMENTAL URETHANE RUBBER PROPERTIES

15 Pts. Black-Cure 30 Min.—40# Steam

After aging	M-300 Psi.	Tensile-Psi.	Elong.-%
7 days at 121° C	1075	4450	710
28 days at 121° C.	1500	1900	500
14 days oxygen bomb	1300	4500	520
14 days H_2O at 70° C.	1600	3200	650
Brittle point		Below —65° C.	
Temperature retraction			
T_{10}		—36° F.	
T_{50}		+12° F.	
T_{80}		+32° F.	

Weathering—no cracking or crazing after 18 months in Florida

	25° C. in Air	70° C. in H_2O
M-300—psi.	1300	1050
Tensile—psi.	5500	3500
Elongation—%	550	750
Permanent set at break—%	15	—
Winkelmann tear—lbs./in.	400	200
Hardness—Shore A	78	—
Yerzley resilience—%	73	75
Swell in—		
ASTM No. 3 oil—4 weeks—%	45	—
Hexane—4 weeks—%	35	—
CCl_4—4 weeks—%	200	—
H_2O—4 weeks—%	3	—

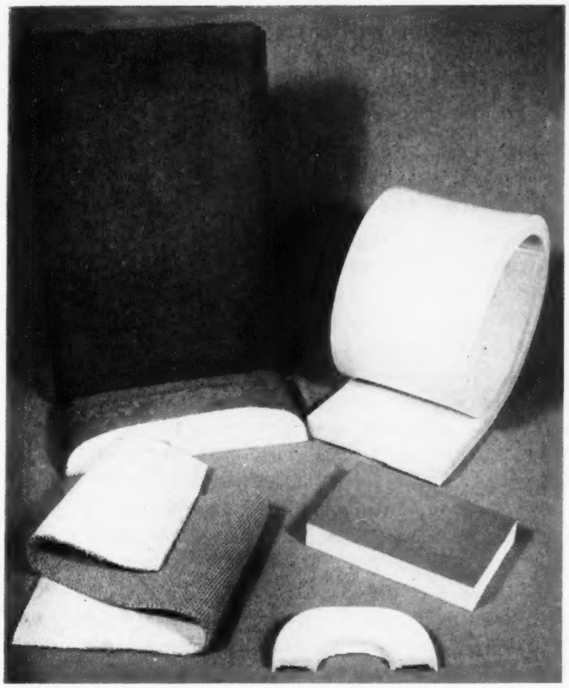

Fig. 4. Resilient polyurethane foam products: cushion foamed-in-place in fabric in mold, *upper left;* slab stock, *upper right;* slab stock coated with "Hypalon" rubber, *right center;* foam molded to metal, *lower right;* foamed-in-place as rug backing, *lower left*

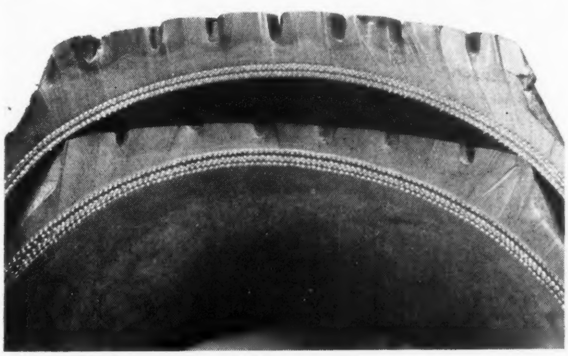

Fig. 5. Comparison of "Adiprene" B *(top)* and first line GR-S tread *(bottom)* after 28,000 miles at 60 mph. Both urethane rubber and GR-S treads were of same design and depth at start

tough, not brittle, and has some ability to recover from deformation. It has good resistance to shock and vibration, good thermal insulating properties, and resistance to oxidation. It should make an excellent structural reinforcing material.

Semi-rigid foam of somewhat lower strength, but with ability to elongate and compress before rupture also has good electrical properties and flexural strength. This material may be foamed in place in complicated cavities and will adhere tightly to various metals, wood, glass, and fabrics.

Resilient foam with excellent ozone, oxygen, and flex resistance has a greater load carrying capacity than natural rubber-GR-S foam at equal density and also has high tensile strength. In addition, it is oil resistant and water resistant, except for continuous exposure to boiling water.

Polyurethane rubber is strong, resilient, has high modulus and hardness, and is oil resistant. Physical properties are retained well up to 70° C. and on aging and weathering. Low-temperature properties are good, and abrasion resistance is outstanding.

Test Procedures Used

Compressive Properties—ASTM D695-52T.*
Tensile Properties—ASTM C297-52T† and D638-52T.*
Shear Properties—ASTM C273-51T.†
Flexural Properties—ASTM D790-49T.*
Water Absorption and Relative Humidity—C272-51T.†
Heat Distortion—ASTM D648-45T.*
Flammability—Federal Specification—SS-A-118a—"Acoustical Units—Prefabricated." Federal Standard Stock Catalog, Section 4, Part 5. Superintendent of Documents, Washington 25, D.C.
Coefficient of Linear Thermal Expansion—ASTM D696-44.*
Sound Absorption—Massachusetts Institute of Technology Tube Method as described in "Acoustic Measurements," L. L. Beranek, John Wiley & Sons, New York (1949).
Electrical Properties—
Dielectric Constant—ASTM D150-47T.*
Power Factor—ASTM D150-47T.*
DC Resistivity—ASTM D257-46.*

* "1952 ASTM Standards, Part 6, Rubber Plastics, Electrical Insulation." American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

† "1952 ASTM Standards, Part 3, Cementitious Materials, Thermal Insulation, . . . Building Units, Etc."

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Water Absorption of Closed-Cell Rubber

Although ASTM specification D1056-53T, a test for absorption to be applied to expanded rubbers of the closed-cell type, is generally satisfactory, expression of the water-absorbing characteristics in terms of percentage change in weight can be highly misleading, according to the November, 1954, *News-Letter* of Rubatex Products, Inc., Melrose, Mass.

The value obtained may serve to distinguish between a completely closed-cell product and a completely open-cell sponge rubber, but it is meaningless in making comparisons between different grades of closed-cell rubber or between samples of the same grade, the author of the article, R. J. Noble, Rubatex vice president of research and development, asserts.

The amount of water absorbed will be proportional to the area of the cut surface, not to the weight of the sample, he points out. Also, results calculated as percentages on the weight of two samples of differing specific gravity have shown that the lower gravity sample has a higher water absorption value.

Mr. Noble proposes, therefore, that the ASTM test be modified by changing the basis of calculation from per cent. change in weight to change in weight per unit of cut-surface area; the latter is expressed in ounces per square foot.

Determination of the Relative Road

Tread depth and weight loss methods of measuring rates of wear with whole tread tires show that the two methods are essentially equivalent in both precision and in actual values obtained for the relative wear ratings, based on variance analysis of two road test programs. Although there are disadvantages in the use of two-way tires, they are five times more efficient than whole tread tires for tests performed under the same conditions.

The relative road wear ratings of different carbon blacks at the same loading, and the same carbon black at different loadings, were influenced by the service severity of the test, and it is not possible to assign a single value to relative road wear performance of carbon blacks.

Increasing ambient temperature caused an increase in the rate of wear of natural rubber tires and a decrease in the rate of wear of synthetic rubber tires.

The road testing of tires to determine manufacturing uniformity and the evaluation of commercial tires for competitive and specification purposes necessitates the use of normal whole tires rather than two-way tread tires. In some cases whole tires are also preferred for the evaluation of test tread compounds because of the opinion that they give more representative results.

[1] Presented at the September, 1954, meeting of the Division of Rubber Chemistry, American Chemical Society, New York, N. Y. Concluded from our Feb., 1955, issue, p. 627.

Whole Tire Road Testing

Although no published information exists comparing the relative rates of wear of the same tread compounds by both whole tire and two-way tread tire road tests, Buist, Newton, and Thornley (3)[2] have obtained the same results from two-way and three-way tire tests, and they suggest that whole tires would behave similarly.

There are a number of inherent disadvantages in the use of two-way tires: (a) The construction of the test tires is complicated by the requirement of maintaining equal weight and tread radius for both halves of the tread. (b) Tread compounds should preferably have the same specific gravity, rates of cure, and mechanical properties. This requirement limits the use of two-way treads to the assessment of relatively small compounding variations. (c) A half tread decreases the number of depth measuring points and, consequently, increases the measurement error. (d) Only depth measurements can be made; whereas with whole tires weight loss measurements provide additional rate of wear data. (e) Unequal rates of wear of both half treads require constant attention to wheel balancing. In extreme cases of unequal wear of the half treads, it is possible that the results obtained are biased by the effect of one half tread on the rate of wear of the other. It is probable that no serious difficulties are encountered with two-way tread tires provided they are carefully constructed, and the rates of wear of the two half treads are not too different (11).

[2] Numbers in parentheses refer to Bibliography items, which appear in our Feb., 1955, issue, p. 639.

TABLE 7. WHOLE TIRE ROAD TEST PROGRAM 409

45 Part Loadings of Three ISAF-GR-S Compounds and an HAF Control Compound

Depth Loss Method—Rate of Wear in Mils/1000 Miles

	Compounds											
	ISAF-4			ISAF-6			ISAF-7			HAF		
Test	1	2	3	1	2	3	1	2	3	1	2	3
Rotation												
1	14.4	15.3	12.3	14.7	16.0	11.9	13.7	17.8	10.4	17.5	17.4	11.7
2	10.0	12.8	10.1	9.9	12.8	9.3	11.2	12.9	11.0	12.2	13.7	12.1
3	11.2	10.4	8.8	11.8	10.6	9.1	11.3	12.3	9.5	13.0	14.5	11.9
4	9.6	9.5	8.8	9.2	8.9	8.0	9.7	9.6	8.0	11.8	11.9	8.7
5	9.0	8.4	8.3	8.7	9.0	8.3	9.3	8.5	8.4	10.9	10.7	9.7
Geometric average		10.4			10.3			10.7			12.3	
Relative rating (HAF = 100)		118			119			115			100	

Weight Loss Method—Rate of Wear in Grams/1000 Miles

	Compounds											
	ISAF-4			ISAF-6			ISAF-7			HAF		
Test	1	2	3	1	2	3	1	2	3	1	2	3
Rotation												
1	82.9	73.8	69.2	88.5	79.5	56.8	95.3	78.3	59.0	106.0	94.2	73.8
2	55.6	74.9	59.0	55.6	77.2	67.0	56.7	73.8	69.2	76.1	96.5	80.6
3	73.8	80.6	64.7	72.6	71.5	55.6	70.4	74.9	60.2	77.2	93.1	69.2
4	43.1	51.1	52.2	44.3	60.2	51.1	51.1	60.2	56.8	65.8	70.4	63.6
5	55.6	54.5	43.1	55.6	52.2	45.4	59.0	57.9	42.0	70.4	72.6	53.3
Geometric average		60.9			60.9			63.2			76.4	
Relative rating (HAF = 100)		125			125			121			100	

Wear Ratings of Tire Tread Stocks—II[1]

By F. H. Amon and E. M. Dannenberg

Godfrey L. Cabot, Inc., Boston, Mass.

Although the published literature (1, 4, 9, 10) contains information on the errors associated with whole tire testing, it is of limited use for comparison with the two-way tire tests described in this paper because of differences in tire sizes, vehicle speeds, test design, measurement procedures, etc. Therefore two whole tire test programs run using identical testing techniques as the two-way tire test programs are described here to establish the testing errors of both the depth and weight methods of measuring tire wear and to compare these errors with the errors previously shown for two-way tire testing.

Road Test Program 409

Road test program 409 comprised three separate road tests at 21,000 miles each, comparing four tires with tread compounds containing three ISAF grades of black and an HAF black control in GR-S at 45 parts loading. Five complete tire rotations of 4,200 miles each were made in each road test. The rate of wear data and the relative tread wear ratings of the ISAF compounds, considering the HAF compound as 100 for both the depth and weight methods, are shown in Table 7. The results of a variance analysis of these data are shown in Table 8.

The coefficient of variation of the rate of wear measurements was 6.1% by the depth and 5.9% by the weight methods (Table 8). The corresponding 95% confidence limits for the relative tread wear rating calculated from the coefficients of variation of the rate of wear measurements are ±4.6% and ±4.3%. These values are expressed as percentage limits so that they must be multiplied by the mean relative rating for each compound to establish the actual confidence limits. Thus, for compound ISAF-4 using the depth measurements in Table 7, the relative rating of 118 would have confidence limits of $\pm 5 (\cong 118 \times 4.6/100)$. Confidence limits of relative ratings determined in this manner can be used to judge whether the relative ratings are significantly different from the control. They are not applicable to judge whether significant differences exist among all four compounds.

TABLE 8. VARIANCE ANALYSIS OF PROGRAM 409

Analysis Performed Using Logarithms of Data in Table 7

Depth Loss Method

Source of Variance	Degrees of Freedom	Sum of Squares	Variance	Variance Ratio (F)	Sig. @ 5%
a) Compounds	3	0.057627	0.019209	(a/g) 51	S.
b) Rotations	4	0.292650	0.073162	(b/e) 6.0	S.
c) Tests	2	0.079479	0.039739	(c/e) 3.5	S.
d) Compounds × tests	6	0.002723	0.000454	(d/g) 0.7	N.S.
e) Tests × rotations	8	0.030546	0.003818	(e/g) 16	S.
f) Compounds × rotations	12	0.009038	0.000750	(f/g) 1.5	N.S.
g) Residual	24	0.016635	0.000693		

Consideration of the compounds shows a highly significant compounds effect and no significant interactions. Therefore the residual variance is used as the estimate of error.

Coeffcient of variation of rate of wear $= \sqrt{0.000693} \times 2.3 \times 100 = \pm 6.1\%$

95% Confidence limits of relative tread wear ratings $= \dfrac{6.1}{\sqrt{n}} \times \sqrt{2} \times t(24\text{ D.F.}) = \dfrac{6.1}{\sqrt{15}} \times \sqrt{2} \times 2.06 = \pm 4.6\%$

Weight Loss Method

Source of Variance	Degrees of Freedom	Sum of Squares	Variance	Variance Ratio (F)	Sig. @ 5%
a) Compounds	3	0.098617	0.032872	(a/g) 27.7	S.
b) Rotations	4	0.241227	0.060307	(b/e) 19.2	S.
c) Tests	2	0.070765	0.035382	(c/e) 10.4	N.S.
d) Compounds × tests	6	0.002595	0.000433	(d/g) 0.7	N.S.
e) Tests × rotations	8	0.081216	0.010152	(e/g) 5.5	S.
f) Compounds × rotations	12	0.011850	0.000988	(f/g) 1.1	N.S.
g) Residual	24	0.015607	0.000650		

Coefficient of variation of rate of wear $= \sqrt{0.000650} \times 2.3 \times 100 = \pm 5.9\%$

95% Confidence limits of relative tread wear ratings $= \dfrac{5.9}{\sqrt{n}} \times \sqrt{2} \times t(24\text{ D.F.}) = \dfrac{5.9}{\sqrt{15}} \times \sqrt{2} \times 2.06 = \pm 4.3\%$

TABLE 9. WHOLE TIRE PROGRAM 439

ISAF and HAF GR-S and Natural Rubber—Oil Extended GR-S Blend Tread Compounds

Depth Loss Method—Rate of Wear in Mils/1000 Miles

Compounds	HAF—GR-S				ISAF—GR-S				HAF NR—Oil GR-S				ISAF NR—Oil GR-S			
Test	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Rotation																
1	11.9	16.0	13.9	13.1	9.8	13.6	13.0	12.3	14.4	18.4	18.7	18.2	13.0	16.3	18.0	16.8
2	9.7	8.8	10.8	8.1	8.4	8.3	9.5	7.4	12.7	11.2	13.9	10.9	11.7	9.7	12.4	9.8
3	13.3	12.9	12.6	12.7	10.8	10.2	11.3	11.2	16.8	14.2	14.6	15.0	15.0	12.9	13.9	13.5
Geometric average	11.8				10.3				14.7				13.3			
Relative rating (HAF-GR-S = 100)	100				115				80				89			

Weight Loss Method—Rate of Wear in Grams/1000 Miles

Compounds	HAF—GR-S				ISAF—GR-S				HAF NR—Oil GR-S				ISAF NR—Oil GR-S			
Test	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Rotation																
1	59.0	107	89.7	89.7	52.2	96.5	84.0	82.9	73.8	123	108	115	64.7	102	95.3	114
2	55.6	60.2	79.5	65.8	45.4	52.2	64.7	62.4	81.7	71.5	109	85.1	67.0	67.0	101	84.0
3	84.0	69.2	68.1	59.0	70.4	54.5	65.8	40.9	109	86.3	81.7	76.0	99.9	71.5	76.0	60.2
Geometric average	72.6				62.4				91.5				81.6			
Relative rating (HAF-GR-S = 100)	100				116				79				89			

In order to determine if significant differences exist among all four compounds it is necessary to establish the minimum difference between any two compounds which is significant at a given level of confidence. With four compounds it is possible to make six independent comparisons of any two compounds. If one were to take a "t" value at a 95% confidence level for the comparison of only two means, and use this value for the comparison of four means with each other, involving six sets of two means, the level of confidence one would have with any one of the six sets would obviously be less than 95% because all six comparisons were made. The probability that the significance of a particular comparison of any two means arising from pure chance is thus six times greater. To correct for the number of comparisons that can be made in a group of more than two means, a higher confidence level for the "t" value is chosen so that the confidence level for any set of two means is sufficiently high. With a group of four means (and six comparisons of two means) a 99% confidence level for "t" will give a 94% confidence level 100 [1 —6 × 1/100] for any two means.

Using this procedure, differences greater than 0.5-mil/1000 miles by depth, and 3.0 grams/1000 miles by weight between any two compounds rate of wear averages are significant at the 94% confidence level.[3] The differences among the ISAF compounds were not significant by either the weight or depth methods. The HAF compound is significantly higher in rate of wear than the ISAF compound. It is evident that in this program the weight and depth methods are equivalent in precision.

Road Test Program 439

Road test program 439 included four tread compounds consisting of 50-part loadings of ISAF and HAF black in GR-S and in a blend of natural rubber and oil-extended GR-S. Each black was tested in both rubbers. Four road tests of three complete rotations each, for a total mileage per test of 13,000 miles, were run. Road testing conditions were the same as for the previous testing programs described.

The rate of wear data and the average relative ratings, using the HAF-GR-S compound as the control taken as 100, for program 439 are shown in Table 9 for both depth and weight measurements. A variance analysis of these data is shown in Table 10. The coefficient of variation of the rate of wear measurement was 5.6% by the depth and 6.8% by the weight methods. Percentage confidence limits determined from these values were ± 5.0% and ± 5.8% respectively. As shown for program 409, the weight and depth methods are about equivalent in precision for this program.

From the average ratings and the 95% confidence limits, it is apparent that there are large significant differences among the test compounds. Using the same type of analysis as described above for program 409, it was found that differences greater than 0.9-mil/1000 miles and 5.2 grams/1000 miles between any two compound rate of wear averages are significant at the 94% confidence level. The compounds containing the blend of natural rubber and oil-extended GR-S were inferior to the GR-S compounds. The ISAF compounds show a significant superiority over the HAF compounds in both types of rubber.

Whole Tire *versus* Two-Way Tire Testing

If we can consider the two whole tire programs and the two two-way tire programs presented above as being representative of these methods of road testing, we can, by comparing the testing errors of the individual measurements, obtain an indication of their relative effectiveness for detecting differences in road wear of tires. In this type of comparison the reproducibility of values between different road tests using replicate sets of tires is not considered since there is no

[3] Calculated from the general formula for significant difference, $\frac{S \times t \times \sqrt{2}}{\sqrt{n}}$

TABLE 10. VARIANCE ANALYSIS OF PROGRAM 439

Analysis Performed Using Logarithms of Data in Table 9

Depth Loss Method

Source of Variance	Degrees of Freedom	Sum of Squares	Variance	Variance Ratio (F)	Sig. @ 5%
a) Compounds	3	0.159931	0.0533	(a/d) 90	S.
b) Rotations	2	0.22217	0.1111	(b/e) 12.5	S.
c) Tests	3	0.015349	0.0051	(c/e) 0.6	N.S.
d) Compounds × tests	9	0.005283	0.00059	(d/g) 2.7	S.
e) Tests × rotations	6	0.053328	0.00890	(e/g) 45	S.
f) Compounds × rotations	6	0.003101	0.00052	(f/g) 2.4	N.S.
g) Residual	18	0.003968	0.00022		

Compounds × tests interaction is significant and is therefore used as the estimate of error.

Coefficient of variation of rate of wear $= \sqrt{0.00059} \times 2.3 \times 100 = \pm 5.6\%$

$$95\% \text{ Confidence limits of relative tread wear ratings} = \frac{5.6}{\sqrt{n}} \times \sqrt{2} \times t(9 \text{ D.F.}) = \frac{5.6 \times \sqrt{2}}{\sqrt{12}} \times 2.26 = \pm 5.0\%$$

Weight Loss Method

Source of Variance	Degrees of Freedom	Sum of Squares	Variance	Variance Ratio (F)	Sig. @ 5%
a) Compounds	3	0.184896	0.061632	(a/g) 71	S.
b) Rotations	2	0.101102	0.050551	(b/e) 1.3	N.S.
c) Tests	3	0.040217	0.013407	(c/e) 0.3	N.S.
d) Compounds × tests	9	0.006828	0.000759	(d/g) 0.9	N.S.
e) Tests × rotations	6	0.229245	0.038208	(e/g) 44	S.
f) Compounds × rotations	6	0.009036	0.001506	(f/g) 1.7	N.S.
g) Residual	18	0.015598	0.000867		

Highly significant compounds effect and no interactions allow use of residual variance for estimate of error.

Coefficient of variation of rate of wear $= \sqrt{.000867} \times 2.3 \times 100 = \pm 6.8\%$

$$95\% \text{ Confidence limits of relative tread wear ratings} = \frac{6.8 \times \sqrt{2}}{\sqrt{n}} \times t(18 \text{ D.F.}) = \frac{6.8}{\sqrt{12}} \times \sqrt{2} \times 2.1 = \pm 5.8\%$$

basis for believing that whole tires or two-way tires would be different in this respect.

For the two two-way tire test programs, coefficients of variation of the relative tread wear ratings of 3.8 and 4.1 were obtained for the residual error. For the whole tire programs, the comparable values for the absolute rates of wear were 6.1% and 5.6% by depth and 5.9% and 6.8% by weight measurements. These values from the whole tire test programs must be multiplied by $\sqrt{2}$ to obtain an estimate of the error expected for relative tread ratings, giving 8.6% and 7.9% for the depth, and 8.3% and 9.6% for the weight methods. Thus the two-way tire measurements appear to have a smaller error than the whole tire measurements.

By taking the approximate averages of 4% for the two-way tire measurements and 8% for the whole tire measurements, the former method appears to be about four times more efficient $[8/4]^2$ than the latter for each individual tread rating measurement. With the tire test designs used in the work described here, four measurements per rotation are obtained with the two-way tire tests against three measurements for the whole tire tests. Therefore the overall efficiency of the two-way tire tests is about five $(4 \times 4/3)$ compared to the whole tire tests. This conclusion confirms the previous conclusions predicted from the testing error of the absolute rate of wear measurements for the control tread compound, and the error of the relative tread wear ratings of the two-way tire test No. 3 of program No. 5435, and also for the complete two-way tire programs 5435 and 558 shown in Table 6.[4] It must be emphasized that these results are only applicable to the particular test designs and procedures used. Williams and Clifton (11) have also stated that the use of two-way tread test tires considerably reduces the variability of test results.

[4] See our Feb., 1955, issue, p. 634.

Estimation of Proper Test Designs

It is interesting to note that the coefficients of variation of the absolute rate of wear depth measurements for the two two-way tire testing programs were 5.3% and 6.1%. These values were determined from the control half treads. The whole tire programs gave similar coefficients of variation of rate of wear of 6.1% and 5.6%. Thus a value of 6% could be used as an estimate of the expected precision for whole tire road tests using the same procedures described in this paper. As an example, if the problem is to establish the relative tread wear rating in a whole tire test of three test tires against a fourth control tire with 95% confidence limits, L%, then the number of measurements required is given by,

$$n = \left[\frac{V \times \sqrt{2} \times t}{L}\right]^2 = \left[\frac{6 \times \sqrt{2} \times 2}{L}\right]^2 = \left[\frac{17}{L}\right]^2,$$

where V is the % coefficient of variation of rate of wear, and "t" is "Student's" value for 95% confidence. For 95% confidence limits of ± 5%, 12 measurements are required, or four separate road tests consisting of three rotations of 4,000 miles each per test. This is equivalent to 48,000 vehicle miles for the complete set of four tires. The same precision could be obtained with only a single road test of

12,000 miles if two-way tread tires were used. These observations are based on the assumption that the differences between duplicate sets of tires required for repeated road tests are negligible, and that tire × test interaction is not significant.

Depth and Weight Methods Equal

One of the advantages of whole tire tests is that both weight and depth measurements can be obtained. It is unfortunate that little can be gained by considering the ratings obtained from weight and depth measurements as replicates and averaged to obtain more precise ratings. The reason for this is that the total error consists of tire-to-tire differences, treatment differences, and measurement error. Since both the weight and depth measurements are made on the same tire, the only contribution that can be made by the additional weight measurement to reducing the total error is in that portion due to measurement error which is felt to be only a small part of the total testing error. It is certainly advisable, however, to use both measurement techniques if possible to detect obvious discrepancies in the data and for added confidence in the results.

It will be noted that the weight ratings obtained in program 409 shown in Table 7 are somewhat higher than the depth ratings, and that for program 439 shown in Table 9 the two methods give almost identical values. In Figure 4 the results of 50 comparisons of depth and weight ratings made during the course of numerous road test evaluations have been plotted. These tests include both 6.70-15 and 8.00-15 tires in natural and synthetic rubbers run under a variety of test conditions. The lines through the points were drawn using the method of least squares. For the prediction of weight loss ratings from depth loss ratings the solid regression[5] line gives the best estimate; whereas for the prediction of depth ratings from weight ratings the broken regression line is used. The standard error of either estimate is ± 5. The correlation coefficient of the data from the two methods is 0.92.[6] In the range of values shown, essentially equivalent results are obtained with the two methods. Similar results have been reported by Stiehler, *et al.* (8).

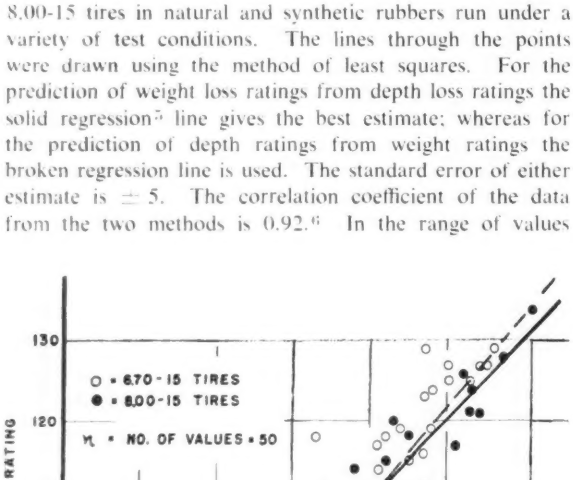

Fig. 4. Correlation of relative treadwear ratings from depth and weight methods

Relative Tread Wear Ratings of Compounds Containing Various Carbon Blacks

The Godfrey L. Cabot, Inc., technical division has been engaged in continuous road testing programs since 1948, and, since that time more than 2,000,000 vehicle miles have been completed. The primary purpose of this work has been the determination of carbon black road wear qualities for manufacturing control and for general tire applications information. These road test programs have consisted almost exclusively of passenger tire tests using 6.70-15 or 8.00-15 tire sizes, and Chrysler Windsor, Chrysler New Yorker, and Oldsmobile 88 vehicles.

Natural rubber, synthetic rubbers, and blends of rubbers containing various carbon blacks and blends of blacks at loadings ranging from 35 to 50 parts have been used in the formulation of the tread compounds evaluated. Information on the general level of road wear properties of various commercial carbon blacks used in tread compounding, the road wear properties of lower reinforcing types of carbon blacks and blends of blacks, and the effect of carbon black loading on road wear level has been obtained during the course of these numerous investigations. With the objective of presenting a broad comparison of the reinforcing properties of various carbon blacks based on actual road testing experience, an attempt was made to use a common reference compound for relating all the wear ratings available for the many tread compounds. The choice of this reference compound fell naturally to combinations of natural rubber or GR-S with 50 parts of HAF black since this particular type of tread compound had been used as the control in many cases. In other studies where the reference compound was not included, indirect comparisons with the reference compound in another study could often be made by assuming

[5] A functional relation between variables which are subject to error or random variation is known as a regression equation or simply as a regression.

[6] The correlation coefficient is a measure of the degree of functional relation between the variables, X and Y. A value of one denotes perfect linear correlation between X and Y; whereas a value of zero denotes no correlation at all between X and Y.

TABLE II. ROAD WEAR RATINGS OF CARBON BLACKS IN NATURAL RUBBER TREAD COMPOUNDS

(HAF @ 50 Parts = 100)

Black Type	Grade	Parts Loading RHC	Rating
Vulcan 9	SAF	42	109
Vulcan 6	ISAF	42	104
Vulcan 3	HAF	35	71
Vulcan 3	HAF	40	78
Vulcan 3	HAF	42	85
Vulcan 3	HAF	50	100
Spheron 6	MPC	50	92
Spheron 9	EPC	42	72
Spheron 9	EPC	50	85
Vulcan 3-Sterling S	HAF-SRF	(40-10) 50	86
Vulcan 3-Sterling S	HAF-SRF	(35-15) 50	75
Vulcan 3-Sterling S	HAF-SRF	(30-20) 50	67
Vulcan 3-Sterling S	HAF-SRF	(25-25) 50	65
Vulcan 3-Sterling S	HAF-SRF	(30-15) 45	71
Vulcan 3-Sterling S	HAF-SRF	(25-15) 40	58
Sterling S*	SRF	50	42

*Estimate from extrapolation of HAF-SRF blends data.

a common road wear level for similar compounds occurring in both studies.

The available road wear ratings for various carbon blacks and loadings in natural rubber tread compounds obtained by the above procedure are shown in Table 11. Of particular interest is the pronounced effect of carbon black loading on wear ratings seen from the HAF and EPC data. SRF black appears to have a very low reinforcing level from the value of 42 obtained by extrapolation of the data of the HAF-SRF blends to 50 parts of SRF. Considering that a non-reinforced "pure" gum compound might have a wear rating of 15-30, it is even more evident that SRF black adds little to the wearing properties of natural rubber tread compounds.

The wear ratings of blacks in "cold" GR-S tread compounds are shown in Table 12. Here again the effect of carbon black loading is seen from the SAF black data. The lower reinforcing grades of black, including SRF, HMF, GPF, and FEF, impart excellent road wearing qualities in synthetic rubber in the range of 60-72. In contrast to the conclusion based on its performance in natural rubber tread compounds, the value of 60 for SRF in synthetic rubber is totally due to black reinforcement since a "pure" gum GR-S tread would have a road wear level approaching zero.

Effect of Rate of Wear on Relative Tread Wear Ratings

The relative performance of tire tread compounds is often related to the road conditions experienced during actual service. Tire compounds developed for use in moderate climates on modern highways may be unsatisfactory in tropical areas on more primitive highways. Tires designed for the American market may not give the anticipated performance under European test conditions. There is some evidence that the different mechanisms of tire tread wear are operative under widely different service conditions. Only a very limited amount of published information is available on this important phenomenon.

Biard and Svetlik (2) have demonstrated that the relative road wear properties of natural and synthetic rubber are related to "severity of service." Under conditions of high service severity, they report that natural rubber gives more than twice the rate of wear compared with synthetic rubber.

TABLE 12. ROAD WEAR RATINGS OF CARBON BLACKS IN SYNTHETIC RUBBER—GR-S TREAD COMPOUNDS

(HAF @ 50 Parts = 100)

Black Type	Grade	Parts Loading RHC	Rating
Vulcan 9	SAF	35	109
Vulcan 9	SAF	40	113
Vulcan 9	SAF	45	120
Vulcan 9*	SAF	50	125
Vulcan 6	ISAF	50	119
Vulcan 3	HAF	50	100
Spheron 4	HPC	50	90
Vulcan 3-Sterling SO	HAF-FEF	25-25 blend	85
Vulcan 3-Sterling SO	HAF-FEF	20-30 blend	82
Sterling SO*	FEF	50	72
Sterling V	GPF	50	70
Vulcan 3-Sterling L	HAF-HMF	25-25 blend	82
Sterling L*	HMF	50	66
Vulcan 3-Sterling S	HAF-SRF	30-20 blend	82
Vulcan 3-Sterling S	HAF-SRF	25-25 blend	78
Sterling S*	SRF	50	60

*Estimates from extrapolation.

The mildest service conditions rate these two rubbers at about the same road wear level. Sjothun *et al.* (5, 6) have shown that the relative performance of synthetic rubber compared with natural rubber tread compounds improves with increasing ambient test temperatures. Stiehler *et al.* (1) have pointed out that different grades of carbon black influence the ambient temperature coefficient of rate of wear and that certain GR-S tread compounds have a negative temperature wear coefficient; whereas the natural rubber tread compounds have a positive coefficient. Buist, Newton, and Thornley (3) found that a 45-part MPC-loaded natural rubber tread compound gave a lower rate of wear compared with 60-part MPC and 60-part ultra-fine furnace black compounds when compared under "normal" conditions, and a complete reversal of this under "abnormal" high service severity conditions. It is further stated that, for this reason, the tread rating of any particular compound cannot be regarded as having an absolute value. Obviously, for the same reason, an absolute tread rating value cannot be assigned to any particular rubber or carbon black.

A number of road testing programs have been completed which give some further information on the effects discussed above. Program 494 was run with three-way, natural rubber passenger tires and consisted of six separate road tests using two different test routes and speeds of 45 and 60 miles per hour. The relative tread wear ratings of compounds containing 42 parts of ISAF and 50 parts of HAF were compared with a control compound containing 42 parts of HAF taken as 100. Data from this program are shown in Table 13. The relative rating of the 42-part ISAF compound increases from 107 to 137 as the severity of test conditions, judged by the rate of wear of the control, increases from

(*Continued on page 780*)

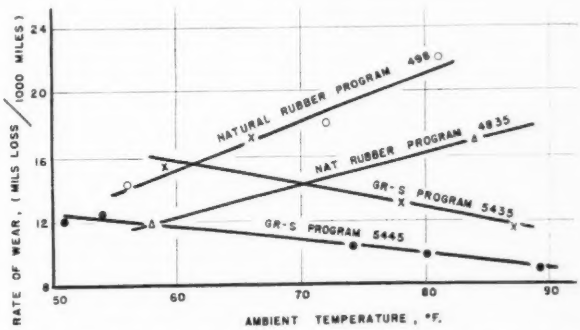

Fig. 5. Effect of estimated ambient temperature on rate of wear of natural and synthetic rubber 6.70-15 tires; HAF black tread compounds

TABLE 13. ROAD TEST PROGRAM 494—EFFECT OF RATE OF WEAR ON RELATIVE TREAD WEAR RATINGS

6.70-15 Passenger Tires—Natural Rubber—Three-Way Construction
42 Part Vulcan 3 (HAF) Control = 100

Road Test No.	Speed	Route	Rate of Wear of Control in Mils Depth Loss per 1,000 Miles	Relative Trend Wear Ratings: 42 Parts ISAF (Vulcan 6)	50 Parts HAF (Vulcan 3)
3	60	Severe	55	137	—
5	60	Normal	28	128	—
4	60	Normal	22	128	129
6	45	Severe	16	122	123
1	60	Normal	16	120	115
2	45	Normal	8.3	115	104
1	45	Normal	6.5	107	104

Zinc Oxide Testing of Latex[1]

By E. W. Madge, H. M. Collier,[2] and J. L. M. Newnham

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Small variations in the amount of naturally occurring soap in concentrated *Hevea* latices are of great importance in the thickening of latices containing zinc oxide.

Less than 0·3% of various soaps added to latex prior to zinc oxide reduces the degree and the rate of thickening; while more than this amount increases the thickening, depending on the soap used.

The mechanical stability of latices containing varying amounts of added soap and a standard amount of zinc oxide increases to a maximum and then drops to a minimum corresponding to a destabilization by the zinc soap formed.

New tests for zinc sensitivity of latex must take into account many hitherto unsuspected factors, and many of the observations discussed in this paper still require further investigation.

Over the last 20 years tests of various types, many of them empirical, have been proposed for the stability testing of latex (1).[3]

Some have been standardized, such as those for KOH number and mechanical stability, and these describe certain aspects of the stability problem. There has, however, been a general desire to devise what has come to be known as a "chemical" stability test; the implication is that such a test would bear a closer relation to the processing behavior of latex, particularly in those processes where pH changes take place during formation of the coagulum and where the particles are in one way or another ionically destabilized or coagulated.

Certain difficulties immediately present themselves. Processes differ widely in their operating conditions so that process interpretation from any one chemical stability test is contentious. Part of the contention has been due to the adoption of empirical end-point determinations so that the conditions of a single process are inordinately favored.

The obvious means of attacking the general problem is to deal adequately with the allied problem of zinc sensitization of latex, as zinc oxide is an active component of the majority of latex mixings. Moreover, in processes which are more susceptible to stability variation such as those involving hot or cold gelling, and such processes are responsible for the largest consumption of latex today, zinc plays a recognizable and powerful role.

The destabilization of ammonia preserved latex by zinc has been a problem of great difficulty not only because of the varied nature of the non-rubber constituents of the latex, but also because of the complication introduced by the way in which zinc forms chemical complexes with ammonia and other constituents of a latex, the composition of these complexes varying with pH (2-4).

Zinc oxide destabilizes ammonia preserved latex partly by ionic adsorption of positive zinc or zinc ammine ions on the negatively charged rubber globules and partly through the formation of zinc soaps (5-6).

[1] Presented before the Third Rubber Technology Conference, London, England, June 22, 1954.

[2] Now resident at the Dunlop Research Center at Batang Malaka in Malaya.

[3] Numbers in parentheses refer to Bibliography items at the end of this article.

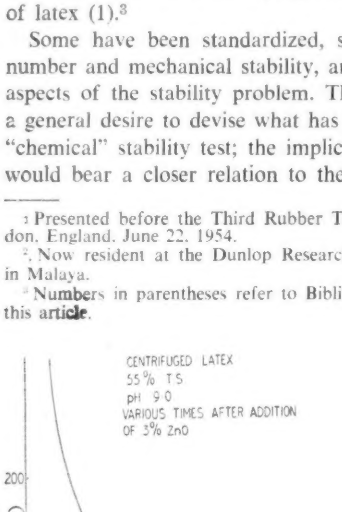


Fig. 1. Effect of rate of shear on the viscosity of zinc oxide treated latex

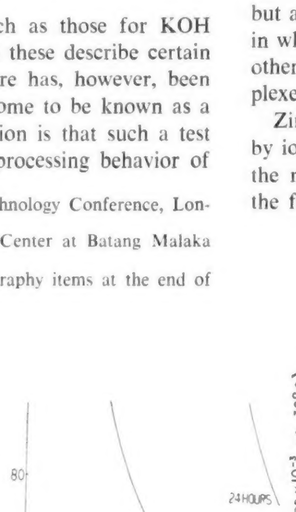


Fig. 2. Effect of pH on viscosity and rate of thickening of zinc oxide treated latex

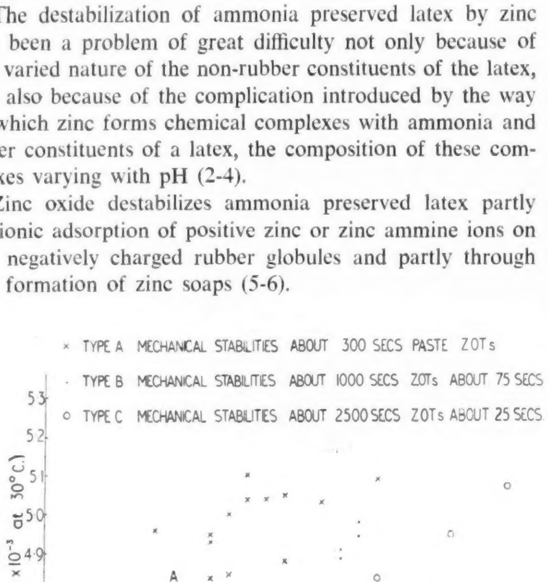
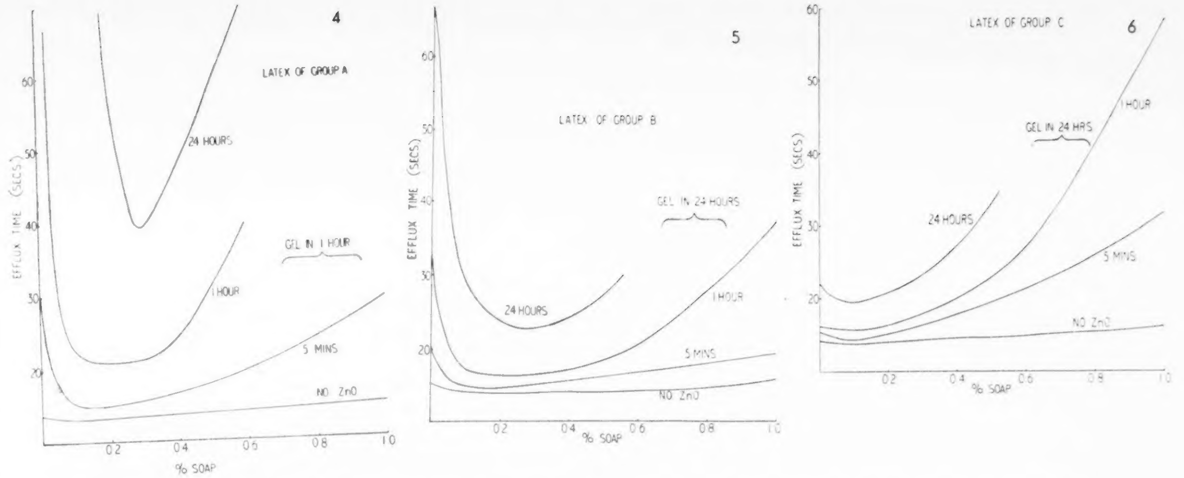


Fig. 3. Relation between KOH numbers and electrical conductivities of latices of different ZOT type



Figs. 4, 5, and 6. Variation in viscosity and rate of thickening of zinc oxide treated latices with sodium castor oil soap content. Latices at pH 9.0, 55% total solids, viscosities determined various times after addition of 3% zinc oxide

Zinc oxide destabilization is therefore contingent on the presence of ammonium salts in the latex, both those which facilitate the solubilization of zinc oxide and the ammonium salts of long-chain fatty acids which react to precipitate zinc soaps. Other non-rubber constituents of latex, for example, proteins, interact with zinc, but it is believed that in gelling processes for mixings containing zinc oxide the main gelling influence is through the solubilizing of zinc and subsequent formation of zinc soaps.

Zinc Oxide Thickening of Latex and the ZOT Test

The ZOT test for latex was described many years ago (7) and records the extent of thickening over a measured period caused by zinc oxide in a latex of very low ammonia content (0·05%). This test has largely had a qualitative rather than a quantitative significance, due partly to the fact that the method of viscosity measurement employed becomes increasingly inaccurate as the latex thickens. Figure 1 shows clearly the variation of viscosity with rate of shear when appreciable thickening with zinc oxide takes place. The determinations were made using a Ferranti viscometer (model VL).[4]

In addition small variations in pH give rise to large variations in the rate of thickening under the conditions of test, i.e., at ammonia content approximately 0·05% (pH 9), Figure 2.

Nevertheless even with the qualitative results obtainable from the standard ZOT test it was thought that for extremes of zinc sensitivity the relative variations in the common tests of ZOT, KOH number, and electrical conductivity would be significant. Figure 3 shows a plot of conductivity against KOH number for three groups of latices, A, B, and C. A and B are centrifuged concentrates, and C electrodecanted concentrates. The individual points represent separate bulk shipments of latex.

Murphy (8) has accounted for the higher KOH number of electrodecanted over centrifuged latex by the fact that the electrodecanted latex contains a higher proportion of small particles and consequently a greater proportion of adsorbed non-rubber constituents.

Murphy (8) and Madge (1) have discussed the relation between electrical conductivity and KOH number. Ammonium salts contribute both to KOH number and to conductivity. Ammonium salts of volatile acids increase conductivity more than the ammonium salts of fatty acids; while salts of strong bases raise conductivity with little effect on KOH number. Comparison of KOH number and conductivity in Figure 3 for latices A, B, and C shows the previously recognized general linear relation, but with significant differences for each latex group. The interpretation of these differences is that the C latices contain a higher proportion of soap than do the B latices, and the A latices a higher proportion of ionic material than the B latices. This is in agreement with Van den Tempel's analyses (9) and fits in qualitatively with the mechanical stability figures.

The Effect of Added Soap on the Zinc Oxide Thickening of Latex

It has already been shown (8) and may be inferred from the above that the presence of small amounts of soap reduces the ZOT; while elsewhere (5-6) it has been demonstrated that the presence of appreciable amounts of soap promotes gelling by the formation of zinc soaps.

It was therefore necessary to carry out a viscosity study of latices containing zinc oxide to which increasing amounts of soap were added beforehand.

Figures 4, 5, and 6 show the paths of thickening for typical latices of groups A, B, and C. In each case the latex was reduced to pH 9 by formalin addition. Increasing amounts of sodium castor oil soap were added, followed by 3% of zinc oxide on the rubber added as a 50% dispersion. Dilutions were adjusted to give a constant total solids concentration. The curves shown in Figures 4, 5, and 6 represent viscosity determinations made before and five minutes, one hour, and 24 hours after the zinc oxide addition.

The striking feature about these three sets of curves was the fact that with increasing soap additions the viscosity always passed through a minimum.

Latex A gave considerable thickening with a minimum in the neighborhood of 0·3% soap; the minimum became sharp after 24 hours. Latex B gave a broad minimum at about 0·25% soap, and latex C which only gave slight thickening had a viscosity minimum nearer 0·1% of soap.

At a higher pH (10·2) a latex of group B containing zinc oxide and 1% ammonium nitrate showed a similar minimum for the viscosity/soap curve (Figure 7). As in the ex-

[4] Ferranti, Ltd., Hollinwood, Lancashire, England.

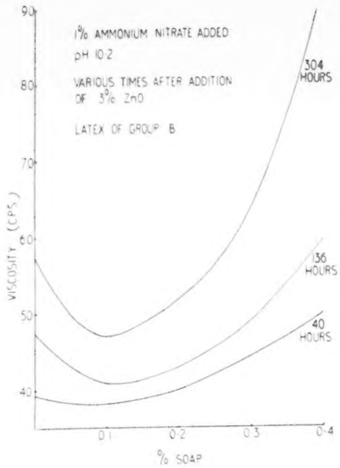


Fig. 7. Variation in viscosity and rate of thickening of a zinc oxide treated latex containing ammonium nitrate with sodium castor oil soap content

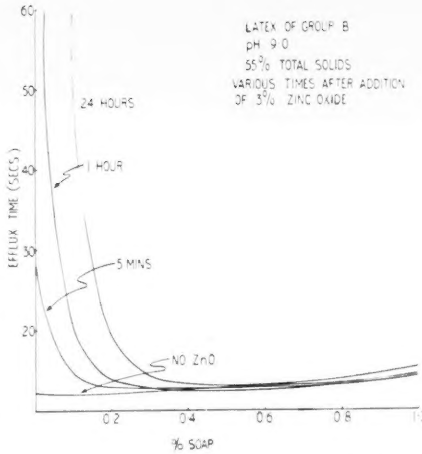


Fig. 8. Variation in viscosity and rate of thickening of a zinc oxide treated latex with Vulcastab LW content

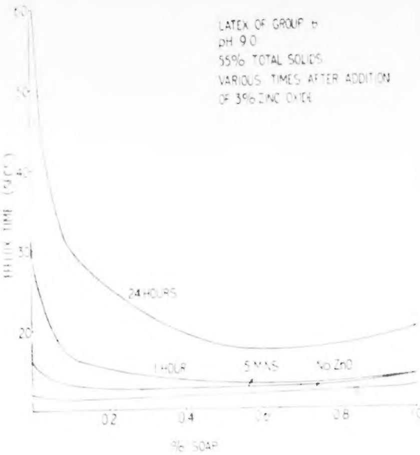
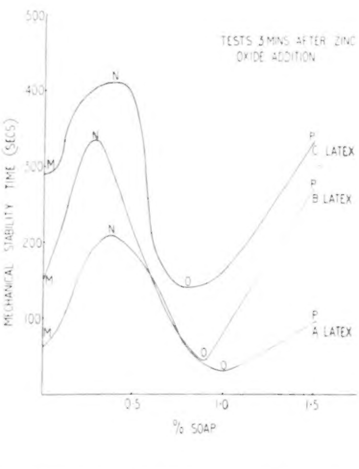
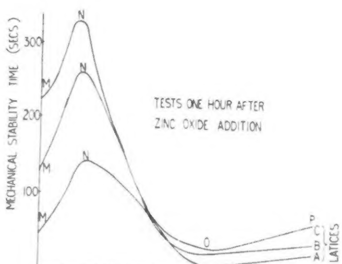


Fig. 9. Variation in viscosity and rate of thickening of a zinc oxide treated latex with ammonium oleate content





Figs. 10 *(left)* and 11. Variation in mechanical stability with sodium castor oil soap content of typical latices of groups A, B, and C treated with zinc oxide

Latices at PH 9·2-9·3, 55% total solids, 3% zinc oxide added

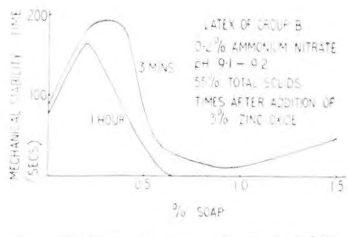


Fig. 12. Variation in mechanical stability of zinc oxide treated latex containing ammonium salt, with sodium castor oil soap content

periments carried out at pH 9 in the absence of ammonium nitrate, the rate of thickening had the lowest value at the minimum point of the curves.

Effect of Different Soaps on the Shape of the Viscosity Soap Curve for Latex Containing Zinc Oxide

Viscosities were measured under the conditions described in the previous experiments for a zinc oxide-containing latex of group B, to which were added prior to the zinc oxide addition increasing amounts of sodium castor oil soap, a non-ionic soap Vulcastab LW,[5] and ammonium oleate, respectively. The results which were then obtained are shown in Figures 5, 8, and 9.

Sodium castor oil soap additions showed a sharp viscosity minimum and a high rate of thickening; a non-ionic soap substantially no minimum and no thickening with time at higher soap additions; while the oleate gave a very broad minimum and again a positive rate of thickening. The non-ionic soap used does not react with zinc.

[5] Imperial Chemical Industries, Ltd., Millbank, London, S.W.1, England.

[6] Klaxon, Ltd., 201 Holland Pk. Ave., London, W.11, England.

The Mechanical Stability Testing of Latices Containing Zinc Oxide and Increasing Additions of Soap

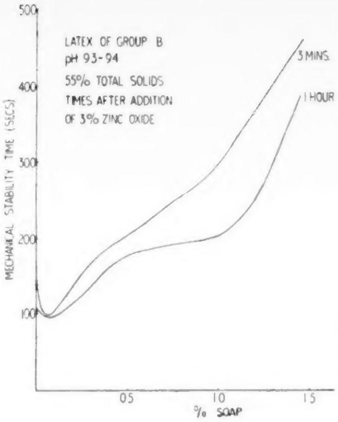
Viscosity determinations of the type described above, although giving most unexpected results, are tedious to perform, are subject to quantitative errors for the reasons described, and would be difficult to formulate as the basis of a method for routine testing.

The standard Dunlop/Klaxon mechanical stability test apparatus[6] (13) was therefore applied to the systems under investigation, and quicker and more clearly defined results were obtained. Transient structural viscosity effects do not influence these results.

The method of experiment was to add increasing amounts of sodium castor oil soap to a latex, then to add 3% of zinc oxide as a 50% dispersion, and to determine the M.S.T. at 14,000 revs. three minutes and one hour after the addition. Final pH's were measured and were approximately constant at 9·3. The M.S.T. was determined at room temperature (20° C.).

The curves obtained for latices of groups A, B, and C were striking and are shown in Figures 10 and 11. As in the viscosity/soap curves, a sharp change in slope occurred at a soap addition of approximately 0·25% and in contradistinction to the viscosity/soap curves the M.S.T. passed through a maximum.

Figure 12 shows similar M.S.T./soap curves for a latex of

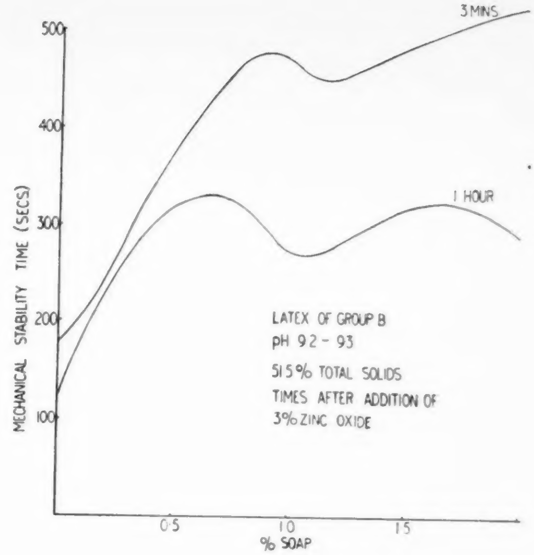


(Left)

Fig. 13 Variation in mechanical stability of zinc oxide treated latex with Vulcastab LW content

(Right)

Fig. 14. Variation in mechanical stability of zinc oxide treated latex with ammonium oleate content



group B to which 0·2% ammonium nitrate was added originally.

It was observed in all cases that before the maximum of the M.S.T./soap curve was reached the end-point of the M.S.T. test was characteristic of that normally experienced with standard untreated concentrate. Beyond the maximum of the M.S.T./soap curve the end-point sharpened considerably, leading to a more rapid and complete coagulation as the soap addition increased.

Interpretation of the M.S.T. Soap Curves

There have been several attempts to carry out mechanical stability tests in the presence of zinc oxide or other chemical destabilizer (7, 10-12).

These have, however, led to no explanation of the properties of a latex, partly because of lack of knowledge of the effects of pH variation and partly because knowledge of the part played by soap in the sensitization of zinc oxide-containing mixings was lacking or at least incomplete. Researches during the last few years have done much to provide the missing data, and one of the objects of the present investigation has been to understand in much more detail the effect of the zinc oxide/soap interaction on stability. The matter is of fundamental importance not only because of the general use of zinc oxide in latex mixings, but because all latex mixings contain a quantity of soap of natural origin or added by way of a dispersion stabilizer or frothing aid.

For the purpose of comparing latices, obviously one soap only should be used. Most of the work has, therefore, been carried out using castor oil soap partly because it is a favored addition in latex processes.

In the curves of Figures 10 and 11 it is reasonable to assume that the increase in stability over the first part MN of the curves is directly associated with a change in the surface protection of the particle. It is tempting to assume that this is simply an adsorption of surface active soap on the latex particles and that the maximum N corresponds to the point where they are fully covered. It is difficult to understand, however, why the addition of zinc oxide does not lead to a normal formation of zinc soap at the particle interface with consequent destabilization. Be that as it may, there is a definite qualitative as well as quantitative change in the system after the maximum N has been passed, and presumably increasing amounts of soap are now available in the serum and free to react with the zinc or zinc ammine ions present.

The portion NO of the curves corresponds, therefore, to a destabilization by the zinc soap formed. The minimum O of curve 10 can be taken as the point where the available zinc is satisfied by the added soap, and thereafter further soap additions give rise to increased stabilization as shown by the portion OP of curve 10. If more zinc is available as in the case of the one hour curve (Figure 11), the portion OP, as might be expected, is substantially flat.

The maximum N was found not to be sensitive to pH variation over the range pH 9 to 10. The slope NO was more sensitive; hence a given pH could be selected for carrying out the test. The results given in Figures 10, 11, and 12 were obtained at pH 9·1–9·3.

Effect of Different Soaps on the Shape of the M.S.T. Soap Curve for Latex Containing Zinc Oxide

It has already been demonstrated that there is a pronounced difference after zinc oxide addition in the viscosity behavior of latices to which increasing amounts of soaps of different types are added (Figures 5, 8, and 9). Latices containing castor oil soap are the most pronounced in their thickening. The effect of a non-ionic soap that does not react with zinc is clear, but it is probable that since both ammonium oleate and castor oil soap lead to the formation of zinc soaps, there must be some specific destabilizing quality of the particular zinc soap formed when castor oil soap is used. In this connection the difference in hydrophilic nature of the two soap molecules is probably of importance.

In a rather similar way to the viscosity relations, castor oil soap was found to have a specific effect on the M.S.T. relations, and the characteristic zinc soaps were found to be strongly destabilizing. Figures 13 and 14 show M.S.T./soap curves for both non-ionic (Vulcastab LW) and ammonium oleate soaps in the presence of zinc oxide, and it will be seen that these are different in type from those of castor oil soap (Figures 10 and 11). Both oleate and non-ionic soap give chiefly a stabilizing effect.

A qualitative difference in behavior was demonstrated when, instead of a zinc oxide addition, an addition of zinc ammine solution was made to latex containing castor oil soap or ammonium oleate. With 0·6% of ammonium oleate present, coagulation did not take place on addition of the ammine solution, but with a similar amount of sodium castor oil soap present, coagulation was immediate.

It is clear that many of the observations described and discussed in this paper still require further investigation for their clarification and fundamental elucidation.

Summary and Conclusions

Viscosity changes in concentrated natural rubber latex under different experimental conditions were investigated with the object of determining the mechanism of zinc oxide thickening and to find reasons for inconsistencies in correlating results of the zinc oxide thickening or ZOT test with other latex tests. It has been found that small variations in the amount of naturally occurring soap are of great importance in the thickening of latex containing zinc oxide, especially at the low ammonia content used for the ZOT test.

The effect of added soap on the ZOT test was found to vary from latex to latex and to be different for different soaps. Less than about 0.3% of various soaps added to latex prior to the zinc oxide reduced degree and rate of thickening. With more than this amount of soap the thickening depended on the soap used.

A similar investigation in which the mechanical stability of latices containing varying amounts of added soap and a standard amount of zinc oxide was measured, showed that the latices varied anomalously with the amount and the type of soap added.

The results of the work presented in this paper show that new tests for the zinc sensitivity of latices must take into account a number of hitherto unsuspected factors, particularly when such tests are required to have a bearing on processing behavior.

Acknowledgments

Acknowledgment is made to Dunlop Rubber Co., Ltd., for permission to publish this paper.

Appreciation is also expressed to D. J. Simcox for considerable assistance in the experimental work described.

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Road Wear Ratings

(Continued from page 775)

6.5 to 55 mils depth loss per 1000 miles. Confirming the effect of carbon black loadings found by Buist, Newton, and Thornley (3), the 50-part HAF black tread compound increased in relative tread wear rating (42 parts HAF compound = 100) from 104 to 129 as the test severity increased from 6.5 to 22 mils/1000 miles loss. Information from recent road tests indicates similar effects with synthetic rubber tread compounds.

Road test programs have included tests run during different seasons of the year with duplicate sets of 6.70-15 test tires. Figure 5 shows the effect of average estimated ambient temperatures on the rate of wear of the HAF control tread compounds manufactured from both natural and synthetic rubbers. The four road test programs included four sets of tires made at different times, but run under the same test conditions. The only conclusion one can make on the basis of these data is that the synthetic rubber tires do seem to have a negative temperature coefficient of wear, and the natural rubber tires a positive coefficient, confirming the findings of Stiehler *et al.* (1). At extremely high ambient temperatures, outside the range shown, it is known that both the natural and synthetic rubber tires fall off markedly in wear performance. No conclusions regarding the relative rubber performance at lower temperatures than shown can be made from these data.

Summary and Conclusions

This paper, which has been published in two installments, has attempted to demonstrate the use of variance analysis and other useful statistical techniques for the interpretation of data obtained during the road testing of tires. Tires for road testing purposes are usually made with a single tread compound for the whole tread, or the tread may be a two-way tread consisting of two different tread compounds. The relative efficiency of these two alternate methods of tire testing from the standpoint of precision has been determined by careful analysis of a number of road testing programs performed under the same conditions. It was shown that the two-way tire tests were five times more efficient in vehicle mileage for the determination of tread compound wear ratings when compared with whole tire tests. In the case of whole tread tire tests, it was found that measurements of rate of wear by tread depth and tire weight loss methods were essentially equivalent in both precision and in the actual values which were obtained for the wear ratings.

Road wear ratings of various grades of carbon black in both natural and synthetic rubber were presented. It was shown that the relative road wear ratings of different carbon blacks at the same loading, and the same carbon black at different loadings, were influenced by the level of service severity or rate of wear. Thus it is not possible to assign a single value to the relative road wearing performance of carbon blacks.

The influence of ambient temperature on the rate of wear of natural and synthetic rubber high abrasion furnace black tread passenger tires was described. Increasing ambient temperature caused an increase in the rate of wear of the natural rubber tires; whereas the synthetic rubber tires actually decreased in rate of wear.

Acknowledgment

We wish to express our gratitude to Godfrey L. Cabot, Inc., for permission to publish this information. The authors also wish to acknowledge the very helpful assistance of Mrs. Fern C. Church in assembling the statistical data presented in this paper.

RUBBER WORLD

EDITORIALS

More Rubber Technology Courses Needed—But How and Where?

IN THIS column in October, 1954, we pointed out that there was an unusual amount of activity at the local level in the United States at the present time in connection with courses in rubber chemistry and technology, of interest apparently to both beginners and those who have been working in the industry for a number of years.

We suggested that the present-day limited availability of technical men was realized both by the industry and the people employed in it, and that was the reason for this interest. We suggested further that the time had come for a coordination of these educational efforts if the industry was not to be handicapped by a future shortage of trained technical personnel.

Readers' Suggestions

We asked for expressions of opinion on this important subject from our readers, and Maurice Shaw, of Englewood, N. J., wrote that possibly this country should follow the lead of the Institution of the Rubber Industry in England. This organization has established standards of education in rubber technology and issues diplomas to candidates who successfully pass written and practical examinations set up by an examination board. These diplomas are recognized throughout England and in many European countries, and young men entering the industry with them are better equipped for their role as rubber technologists than others with only Bachelor of Science degrees in chemistry or other scientific subjects.

Another respondent, Michael M. Kahn, of Nutley, N. J., concluded, however, that the study of the characteristics and processing of rubber should be incorporated in existing chemical engineering courses to as great an extent as possible, but that the establishment of isolated courses should not be encouraged.

The above discussion is concerned mostly with courses already being given in many colleges and universities throughout the country for the training of young men before they enter upon a career in the rubber industry. How about those already working in technical capacities in the industry? Several of the local rubber groups have been giving courses in rubber technology for some time, and others have recently organized such courses, primarily for those already employed. As the number of these courses and the number of people taking them increase, the importance of the subject matter and its scope are also increased.

Need of Coordination Recognized

Some recognition of the need of coordination of effort on education in rubber chemistry and technology is evident in the recent formation of an Education Committee by the Division of Rubber Chemistry of the American Chemical Society. This committee is giving some thought to the problem of examining the courses being given in the several colleges and universities with the view of determining what a reasonable standard of quality and practicality for such courses should be.

Of even greater importance is the attitude of management in the industry regarding efforts to train men in college and in industry so that the amount of training the individual company would have to do might be reduced.

The problem of what should be done further to improve the educational facilities for those interested in technical work in the rubber and related industries is difficult and complex, but the problem is real and cannot be ignored.

The Philadelphia Rubber Group recently worked out with Villanova University in that city a course in basic rubber technology which is being given in the evening division as a part of the chemical engineering curriculum at the graduate level. Enrollment for the course was 169, and at least 25 more men were not able to take the course because of a limitation on the size of the lecture hall. Among the participants are a company president, two vice presidents, several technical directors and chief chemists, as well as beginners in the industry. Other local rubber groups have probably had similar experiences.

Where Do We Go from Here?

Do the rubber and related industries and their technical men, both present and future, want a coordinated educational program in rubber technology in this country? Let's answer this question first.

R. G. Seaman

EDITOR

Meetings and Reports

Synthetic Rubber, Compounding Ingredients, and Elastomeric Foam Sponge Activities Considered by ASTM Committee D-11

In addition to the meetings of 19 subcommittees and Committee D-11 on Rubber and Rubber-Like Materials at the meeting of the American Society for Testing Materials in Cincinnati, O., during the week of January 31, some interesting discussions and some actions were taken in connection with possible future activities of Committee D-11 in the fields of synthetic rubber, compounding ingredients, and elastomeric foam sponge.

Indications are that several test methods from "Government Specifications for Synthetic Rubbers" of the Office of Synthetic Rubber of the Federal Facilities Corp. will become ASTM standard methods in the near future. The possibility that Committee D-11 should extend its scope to include work on compounding ingredients will be given serious consideration at its next meeting in June. The need of test methods on elastomeric foam sponge materials made from vinyl resins and polyurethane elastomers has become evident. The interest of other technical societies and trade associations in this field has to be considered, however, before a decision regarding the jurisdiction over any such test methods is decided.

Committee D-11

At the meeting of Committee D-11 on the morning of February 4, Chairman Simon Collier, Johns-Manville Corp., presided and was assisted by A. W. Carpenter, The B. F. Goodrich Co., secretary. This meeting was featured by two papers on stress relaxation, by virtue of the efforts of H. G. Bimmerman, E. I. du Pont de Nemours & Co., Inc., recently appointed chairman of a new subcommittee on programs, symposia, etc.

Minutes of the last meeting of Committee D-11 held in Chicago in June, 1954, were approved, and it was announced that the new D-11 handbook would be available during February and would incorporate the actions voted on at the Chicago meeting.

The motion that a new subcommittee on synthetic elastomers with a scope as broad as possible be organized was approved. Specific recommendations made to subcommittee 12 on Crude Natural Rubber regarding government test methods desired by synthetic rubber producers as ASTM standards will be transferred to the jurisdiction of this new subcommittee, and an attempt will be made to include a recommendation for action in the annual report of Committee D-11 in June, 1955.

A motion was voted that Committee D-11 confirm the recommendation of the advisory committee and give further consideration to broadening the scope of D-11 to include work on compounding ingredients and then letter-ballot this recommendation in D-11.

It was announced that the Navy Department's Bureau of Ships had paid special tribute to the work of subcommittee 25 on low-temperature tests, with special reference to the work of this D-11 subcommittee with Committee E-1 on Methods of Test. The Bureau of Ships suggested the formation of a coordinating committee in Committee E-1 on flammability, and a motion was made and passed to recommend such a committee.

New subcommittee chairmen announced were E. M. Bader, Goodrich, for subcommittee 28 on Statistical Quality Control and C. P. Mullen, Gates Rubber Co., on Hose.

The meeting was then turned over to Mr. Bimmerman, who introduced S. A. Eller and John M. Reynar, who presented the papers on stress relaxation.

In a paper entitled, "Stress Relaxation of Vulcanized Rubber in Compression and Tension," by Mr. Eller, Material Laboratory, New York Naval Shipyard, the Chatten-Eller stress relaxation apparatus was described. This apparatus is essentially the same as that used to measure the compression set of vulcanized rubber at constant deformation, described in ASTM Method B of D395. An important feature of the apparatus is an electrical means to indicate when the back force of the compressed specimen is equal to the external load applied by the load measuring device.

Also described was a tension stress relaxation apparatus which consists essentially of a removable jig to maintain a T-50 type of specimen at a desired elongation and means to measure the back or restoring force in the elongated specimen.

Tests were made to determine the relation between stress relaxation in compression and in tension with respect to the percentage of deformation. The results showed that stress relaxation in compression of both GR-S and Butyl stocks decreases with increase in deformation. No significant change in stress relaxation was observed for the GR-S and Butyl stocks deformed in tension. At the same percentage deformation, the stress relaxation of both GR-S and Butyl stocks is higher in compression than in tension.

Tests were also made to determine the relation between stress relaxation in compression and in tension with respect to continuous aging at room and elevated temperatures (194° F.). The results showed that stress relaxation of both GR-S and Butyl stocks in compression and in tension increased with aging time and temperature. The Butyl stocks exhibited higher stress relaxation at 194° F. in both compression and tension than the GR-S stocks; whereas at room temperature the reverse was true.

In the paper, "Stress Relaxation of Non-Metallic Gasket Materials," by David R. Lem and John M. Reynar, of the Detroit Arsenal, the results of tests on all types of non-metallic gasket materials, including rubber, cork in rubber, fiber rubber, rubber asbestos, asbestos paper, fiber resin, etc., made with the Farnam-Cole Relaxometer[1] were described. This apparatus, while not considered the ultimate in what is required of such instruments, was considered to be currently adequate for qualification testing.

A testing procedure and formula were presented for accurately determining percentage stress relaxation. Curves were presented to illustrate stress relaxation in all types of commercial gasket materials, and this property was reduced to a numerical value for insertion into tables of data.

The authors of this paper recommended that a tentative ASTM method be set up for the measurement of percentage stress relaxation of non-metallic materials by means of the compression capsule described, the procedure and formula presented, and with a fixed-load, continuous-stress reading instrument that can yield results as good as or better than those presented.

F. C. Thorn, in commenting on the above two papers on stress relaxation, suggested that any method of test for this property requires a removable jig since user requirements are likely to be for as many as 20 tests a day. A second consideration is that the tests be run at service temperature rather than room temperature since room temperature tests are not generally an index of behavior at service temperatures. Signaling the beginning of recompression can best be done in the most reproducible manner by the use of

[1] India RUBBER WORLD, Mar., 1951, P. 679.

an electrical signal in a way similar to that demonstrated by the Chatten-Eller apparatus, it was said. Finally, the apparatus for stress relaxation testing should permit the sample to be compressed to a predetermined strain or stress since for commercial gasketing the greatest interest lies in starting with a predetermined stress; while for some testing for the military it is desired to start with a predetermined strain.

Mr. Thorn exhibited modifications of the Cole-Farnum or Hopkins-Farnum jig, as he preferred to call it, which included unrestricted platen areas deep enough to accommodate stacked specimens, a recoil collar deepened and equipped with a bronze bushing to insure complete parallelism between the collar and the upper platen to provide for a sharp electrical signal, and, finally, removal of the necessity of the precise parallelism between the upper platen and the recoil collar by use of a simple screw located in the neutral axis. He planned to report further on the use of the last modification at the June meeting and offered to provide detailed prints of it to interested persons.

D-11 Subcommittee Meetings

Subcommittee 4—Protective Equipment for Electrical Workers. Gordon Thompson, Electrical Testing Laboratories, chairman. No meeting of this subcommittee was held, but R. H. Titley, Public Service Gas & Electric Co. of N. J., chairman of the section working on revision of D1051, Rubber Insulating Sleeves, reported that this new revision was being letter-balloted and would be presented to Committee D-11 at its next meeting.

Subcommittee 5—Wire and Cable. John T. Blake, Simplex Wire & Cable Co., chairman. It was reported that the revision of 13 standard methods and the preparation of three new tentative standards had been completed after three years' work and will appear in the new Committee D-11 handbook.

With the cooperation of the ASTM headquarters it is planned to publish these latest wire and cable specifications in a separate pamphlet during the Summer of 1955.

Subcommittee 6—Packings. F. C. Thorn, Garlock Packing Co., chairman. A section was formed to revise D733, Testing Compressed Asbestos Sheet Packing. A proposed change in the conditioning procedure will be considered at the same time.

A proposed specification for second-grade red sheet packing will be letter-balloted in the subcommittee.

The subcommittee chairman was authorized to circularize the subcommittee with respect to the properties to include in a tabular specification for rubber sheet packings and the present status of test procedures for these specifications.

Subcommittee 9—Insulating Tape. R. H. Titley, chairman. A Proposed Specification for Ozone Resistant Tape was recommended for adoption as a tentative ASTM standard subject to letter-ballot in Committee D-11 and subcommittee 9.

I. D. Patterson, who represented synthetic plant operators before D-11

A section will be appointed to study D69, Friction Tape for General Use for Electrical Purposes, and D119, Rubber Insulating Tape, with the following revisions contemplated: (1) tolerances or interpretation of them; (2) description of oven used for cold and hot adhesion tests in D69; (3) sampling methods in D69 and D119 and also in the Proposed Specification for Ozone Resistant Tape.

This section will also review the Proposed Specification for Ozone Resistant Tape with the objective of increasing tensile strength specification from 250 to 350 psi., and increasing elongation specification from 300 to a 450% minimum and a 650% maximum. The section will also review the possibility and need of separate test methods for D69, D119, and the Proposed Specification for Ozone Resistant Tape.

Another section will be appointed to write statements on significance of test.

Subcommittee 10—Physical Testing of Rubber Products. L. V. Cooper, Firestone Tire & Rubber Co., chairman. B. S. Garvey, Jr., Sharples Chemicals, Inc., presented a motion to change the allowable distance between mill roll guides as stated in D15, Sample Preparation for Physical Testing of Rubber Products, from 10.25 ±0.25 to 10.25 to 12.0 inches, but this motion was defeated.

The subcommittee recommended to Committee D-11 that an additional sketch of a test slab mold to be made by the cut-off bar method with a ¾-inch lower plate be included in D15.

A task group will be appointed to investigate the possibility of a tentative method of test for the evaluation of the physical properties of O-rings.

The task group on buffing methods will recommend to the ASTM editor on standards such editorial changes as are necessary to allow the use of buffing machines available commercially at the present time.

G. E. Decker, National Bureau of Standards, presented a paper entitled, "Temperature Control during Mixing of Rubber Compounds," in which he described a laboratory mill roll designed and built at the Bureau in which the circulating fluid enters the central cavity and returns through 12 parallel ducts. Wall thickness of this mill roll at the ducts is 7/16-inch. A well is provided to permit a thermocouple to be placed within ¼-inch of the surface of the roll. The time required for the surface of the NBS roll to increase 50° F. was 0.8-minute, compared with five minutes for a roll with a two-inch wall, 2¼ minutes with a one-inch wall, and 1.2 minutes with a special roll manufactured by National Rubber Machinery Co.

A special system and controls for the heating fluid for use with the new NBS roll has also been developed, and the control of mill roll temperature during the mixing of several different batches of compounds was described. Very considerable improvement in temperature control was apparent.

Subcommittee 11—Chemical Analysis of Rubber Products. W. P. Tyler, Goodrich Research Center, chairman. A method for the determination of iron in crude natural rubber and GR-S was recommended for letter-ballot in Committee D-11, subject to some final modifications to be worked out by the task group within the subcommittee during February.

A report on the analysis of free carbon in natural and synthetic rubbers by pyrolysis in an inert atmosphere revealed the need of more study of the fundamentals before a suitable method can be devised for all rubber products.

There is a definite indication that the high-temperature combustion method for sulfur analysis will become useful and possibly quite accurate for a rapid method.

It has been found that interest among members of subcommittee 11 on the use of infrared methods of analysis of elastomers is quite limited at this time.

Subcommittee 12—Crude Natural Rubber. N. Bekkedahl, NBS, chairman. A task group headed by A. E. Juve, Goodrich Research Center, submitted a report entitled, "Mooney Viscometer Cure Characteristics of *Hevea* Rubber," by G. E. Decker and John Mandel, NBS. This work, which was in the form of an interlaboratory test involving five laboratories and was done using pale crepe and "red," "yellow," and "blue" Technically Classified Rubber, led to the conclusion that the use of the Mooney viscometer is satisfactory for classifying natural rubber as to scorch rate and rate of cure. Publication in the *ASTM Bulletin* was recommended.

R. D. Stiehler, NBS, reported on some experiments conducted on blending smoked sheets in a Banbury mixer at the Goodyear Tire & Rubber Co., aimed toward the preparation of a standard sample of natural rubber. It was concluded that if a lot of 10 tons of rubber obtained from a single lot of blended latex from a single plantation was not sufficiently uniform for use as a standard sample, its uniformity could be improved by Banbury blending. The principal problem involved in providing a standard sample of natural rubber is now not a technical one, but a financial one.

I. D. Patterson, Goodyear, representing the future private industry operators of the

government synthetic rubber plants, reported the results of a meeting of these operators, which included the following recommendations to ASTM Committee D-11.

From the "Specifications for Government Synthetic Rubbers," the synthetic rubber producers recommend the following test methods be considered by ASTM Committee D-11 for adoption as standards: (1) moisture by the hot mill method; (2) ash; (3) carbon black in masterbatch; (4) bound styrene in butadiene-styrene rubbers; (5) Mooney viscosity; (6) physical properties of vulcanizates including compounding recipes, mixing procedures, equipment, and curing and testing methods.

A motion was passed that these methods be submitted by subcommittee 12 to Committee D-11 for adoption as tentative standards, subject to letter-ballot in D-11.

The following amendment by Dr. Stiehler to the motion was also approved.

(1) That Committee D-11 accept in principle the recommendation of the synthetic rubber producers.

(2) That the chairman of D-11 immediately appoint a new subcommittee on synthetic elastomers to consider these recommendations, to draft where feasible modifications of existing standards or to prepare new standards where necessary, and to resolve any differences with the synthetic rubber producers that may exist between ASTM standards and the "Specifications for Government Synthetic Rubbers."

(3) That the D-11 chairman contact the GR-I (Butyl) producers for any additional recommendations and include them with those of the GR-S producers.

(4) That the new subcommittee complete its assignment promptly so that the recommendations can be included in the annual report of Committee D-11 this June.

Subcommittee 15—Life Tests on Rubber Products. G. C. Maassen, R. T. Vanderbilt Co., chairman. The following recommendation of J. E. Norton, Atlas Electrical Devices Co., with respect to measurement of temperature in the Fade-Ometer and Weather-Ometer, in D750, Resistance to Accelerated Light Aging of Rubber Compounds, was presented to Committee D-11 for letter-ballot:

"The temperatures within the apparatus shall be controlled by the circulation of sufficient air to produce a black panel temperature of 145° ± 5° F., when measured by a standard black painted panel with a suitable thermometer of thermocouple embedded in the surface. The panel temperatures shall be taken in a position where the water spray is not striking the panel and at the point where maximum heat is developed due to light exposure."

The task force working on the adoption of the triangular strip for sunlight aging tests was instructed to write a specification for approval, including in it the use of the Goodyear-type die.

A task force was appointed to investigate the measurement of rate of the flow of air through single cell aging chambers and to determine the effects of various rates of air flow on aging test results.

Subcommittee 16—Classification and Specifications of Rubber Compounds. J. F. Kerscher, Goodyear, chairman. The chairman reviewed the recommendations made by the task group at the June, 1954, meeting[2] relating to the work of the subcommittee. It was mentioned that there had been no response to the request that the various product subcommittees of Committee D-11 provide in tabular form the desired physical properties and limits for the product compounds under their supervision.

Another meeting of the task group was held on January 19, and the minutes of this meeting were read by J. J. Allen, Firestone. The conclusions regarding possible courses of action for the development of a compound classification system were as follows: (1) a simple modification of D735, Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications; (2) the use of the proposed German system of coding and tabulating properties; (3) a complete modification of D735; (4) setting up tables and a coding system based on end-products.

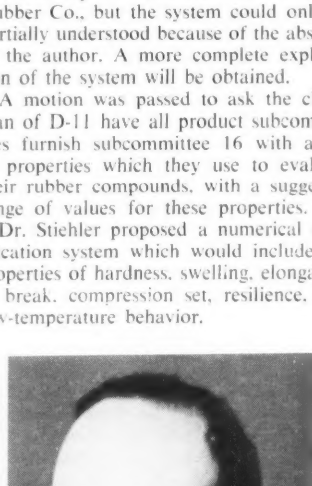
Mr. Allen is to work on a simple revision of D735, which could be accomplished by removing heat aging, compression set, and oil aging from the basic requirements and putting them under suffix letters and reestablishing "OO" grades. Volume swell figures would remain in the SA, SB, and SC tables.

Information on the proposed German system of coding and tabulation was provided in detail, and its use demonstrated for a gasoline hose compound, by the subcommittee chairman.

A complete modification of D735 was submitted by W. E. Scoville, United States Rubber Co., but the system could only be partially understood because of the absence of the author. A more complete explanation of the system will be obtained.

A motion was passed to ask the chairman of D-11 have all product subcommittees furnish subcommittee 16 with a list of properties which they use to evaluate their rubber compounds, with a suggested range of values for these properties.

Dr. Stiehler proposed a numerical classification system which would include the properties of hardness, swelling, elongation at break, compression set, resilience, and low-temperature behavior.



S. A. Eller, presented paper before Committee D-11

S. R. Doner, Raybestos-Manhattan, Inc., emphasized that modification of D735 was the best approach to classification of rubber compounds other than automotive and aeronautical because of the familiarity and acceptance of this system among rubber compounders generally for the past 10 years.

Subcommittee 17—Hardness, Set, and Creep. Mr. Doner, chairman. Proposals of the International Standards Organization, Technical Committee 45 on Rubber, on compression set and hardness determinations at low temperatures will be reviewed by a task group, and comments supplied to Irving Kahn, U. S. Army Ordnance Corps, who heads the American working group of the ISO Committee on this work.

A. E. Juve reported that, following discussions and correspondence with J. R. Scott, Research Association of British Rubber Manufacturers, Dr. Scott agrees that there is too much difference between hardness readings of the ISO hardness meter and the Shore A durometer to be considered equal, particularly in the low and middle ranges of the hardness scale. Dr. Scott, however, has not been able to get the British Standards Institute to recognize this difference.

S. A. Eller presented that portion of the paper on stress relaxation testing dealing with testing in compression which he also presented before the D-11 Committee. He then submitted a proposed method of test for stress relaxation of vulcanized rubber in compression which will be letter-balloted in the subcommittee.

The task group on hardness testing, which is to obtain more information on the correlation of ISO *versus* Shore hardness for various types of rubbers, is about to begin its program.

W. E. Scoville will head a task group to revise D676, Indentation of Rubber by Durometer, to bring it into line with accepted practice with regard to the number of readings to be taken for each determination. The matter of overlapping where hardness specifications in D735 are set up in increments of 10 points with an allowable variation of ±5 points was referred to subcommittee 16.

The task group on the use of the Shore D durometer and its calibration reported that very little apparent use of this instrument could be found.

Subcommittee 19—Properties of Rubber and Rubber-Like Materials in Liquids. W. Newlin Keen, du Pont, chairman. The following changes in D471, Changes in Properties of Rubber and Rubber-Like Materials in Liquids, were recommended for letter-ballot in Committee D-11: (1) change paragraph 3(a) to conform to the new recommended practice for test temperatures for room temperature and above; (2) change the 30-day immersion period in paragraph 3(b) to 28 days.

The joint task group of subcommittee 19 and section 4-H of SAE-ASTM Technical Committee on Automotive Rubber has the assignment to develop and report by June testing procedures for conducting fluid immersion tests on elastomeric vulcanizates at temperatures above 250° F., with par-

[2] RUBBER WORLD, July, 1954, p. 521.

ticular emphasis on 300° F., if D471 is found to be inadequate. S. R. Doner submitted some data that had already been obtained in connection with this work, and F. C. Thorn stressed the importance of considering service conditions in developing any such tests. Mr. Thorn also asked that paragraph 12(a) of D471 be changed to include the use of a valved tube so that compressible gases can be used in liquid form. He will submit a proposed method to the subcommittee.

Subcommittee 20—Adhesion Tests. H. H. Irvin, Marbon Corp., chairman. As a result of a round-robin test program on the revision of D429, Adhesion of Vulcanized Rubber to Metal, Method B, and the cooperation of subcommittee 28 on statistical analysis in this connection, a letter-ballot in Committee D-11 will be requested for the adoption of the Method B revision.

The round-robin test program on revision of Method A of D429 is about completed, and the results will be analyzed by subcommittee 28 and reviewed by subcommittee 20 in the near future.

Copies of the proposed revisions of Methods A and B of D429 have been forwarded to ISO/TC 45 on Rubber for comment.

Information on adhesion testing at temperatures above and below room temperature is solicited by the chairman of subcommittee 20 for discussion at the June meeting. Interest in non-destructive testing indicates that this subject will also be continued before subcommittee 20.

Subcommittee 22—Cellular Rubbers. H. G. Bimmerman, chairman. The task group on sponge rubber headed by C. S. Yoran, Brown Rubber Co., reported the following comments from section 4N of SAE-ASTM Technical Committee A: (1) Tensile test limits for sponge rubber are not considered desirable because of lack of reproducibility and lack of importance as a determining factor in sponge rubber use. (2) There has been no desire indicated for staining tests. (3) Section 4N is not interested in specifications for polyacrylic or silicone rubber sponge. (4) A more descriptive requirement on expanded rubber is needed. (5) Test methods are needed for adhesion requirements of sponge as designated by the suffix letters, K_1, vulcanized bond, and K_2, bond after vulcanization, in D1056, Sponge and Expanded Cellular Rubber, specifications. Mr. Yoran will report on items 4 and 5 at the June meeting.

E. C. Svendsen, U. S. Rubber, head of the task group on foamed rubber reported that The Rubber Manufacturers Association, Inc., now calculates compression set using the original height of the specimen, and subcommittee 22 is in favor of this method, which preference will be further determined by letter-ballot.

The need of F (low-temperature set) limits for expanded rubbers is to be investigated. Difficulty experienced in specifying the type of sponge to use in certain thin sections due to difficulty in obtaining reliable deflection figures will be clarified by changing the text of D1056 and adding an explanatory note.

Test methods for vinyl and polyurethane sponge are needed, and activity in this connection in the SAE, the RMA, the Society for the Plastics Industry, and Committee D-20 on Plastics of ASTM, as well as in Committee D-11, will be reviewed at a meeting of an SPI group in Cleveland, O., in the near future. Jurisdiction of any proposed test methods will have to be clarified. Publication of these methods by ASTM "For Information Only" is a possibility.

George E. Decker, who gave a paper before subcommittee 10

R. H. Walsh, du Pont, presented a new method of determining the percentage of closed and open cells in cellular rubbers, and this method is being circulated in subcommittee 22 for comment.

Subcommittee 23—Hard Rubber. C. P. Morgan, Vulcanized Rubber & Plastics Co., chairman. Acting chairman of the Asphalt Section, Robert J. Wentland, reported that Scott Testers, Inc., is interested in building a drop-ball tester of the Richardson Co. design for asphalt, rubber, and plastics, but that it will be necessary for agreement to be reached between Committees D-11 and D-20 on specifications for such apparatus.

The hot-cold cycle test procedure for asphalt containers of the Richardson Co. is to be considered in connection with a revision of the method in D639, Asphalt Battery Containers, in order to provide a more realistic specification.

Acting chairman of the Hard Rubber Section, W. J. Dermody, Stokes Molded Products Co., reported that the drop-ball method as an alternate for impact testing in D530, Testing Hard Rubber Products, will be submitted to Committee D-11 for letter-ballot. The subcommittee will be letter-balloted in advance of the June meeting regarding inclusion of the new test temperatures as agreed on by Committee E-1, for possible use with the above recommended drop-ball method.

Specifications for soluble iron will be revised, and a specification for soluble manganese included.

A member of subcommittee 23 will be appointed for liaison with Committee D-20 on work on impact testing.

The need of an adequate hardness tester for hard rubber in view of the variables encountered in using the Rockwell and Shore D durometers for this purpose was stressed.

Subcommittee 25 — Low-Temperature Tests. R. S. Havenhill, St. Joseph Lead Co., chairman. Drafts of low-temperature methods for hardness, stiffness, brittleness, and compression set have been prepared by the American working group for submission to ISO/TC 45 on Rubber by Irving Kahn. A task group will review these methods and submit their comments to the chairman of subcommittee 25 for transmittal to Mr. Kahn prior to March 1.

F. S. Conant, Firestone, presented important changes and additions proposed to bring D832, Conditioning of Rubber and Plastic Materials for Low-Temperature Testing, up to date. Among these changes were a new title for D832 to read, "Conditioning of Rubber and Other Elastomeric Materials," inclusion of the latest elastomers in the section on crystallization, and details of a liquid conditioning bath. A final draft is expected by the time of the June meeting.

Negative votes on D1329, Temperature-Retraction Test Procedure, one requesting the use of a thermocouple as well as a thermometer and the other regarding the value of the method, were resolved since the procedure, as written, provides for a thermocouple or a thermometer, and the fact that the method is already in extensive use would seem to indicate its value.

Subcommittee 26—Processibility Tests. R. H. Taylor, Scott Testers, chairman. On the basis of a report of the task group on the effect of different types and kinds of dies on the determination of Mooney viscosity of rubbers, the subcommittee will be letter-balloted on the following recommendations to Committee D-11: (1) D927, Viscosity of Rubber and Rubber-Like Materials by the Shearing Disk Viscometer, be modified to permit the optional use of integral, radially grooved dies. (2) A note should be added to D927 cautioning against the unqualified acceptance of Mooney values determined on the so-called high molecular weight polymers. (3) D1077, Curing Characteristics of Vulcanizable Rubber Mixtures during Heating by the Shearing Disk Viscometer, be modified to permit use of die temperatures instead of cavity temperatures when integral, radially grooved dies are used and to require the type of dies and the method of temperature measurement be included in the report.

It was recommended to Committee D-11 that D926, Plasticity and Recovery of Rubber and Rubber-Like Materials by the Parallel Plate Plastometer, be advanced from a tentative to a standard method.

Subcommittee 28—Statistical Quality Control. E. S. Bader, chairman. Mr. Bader, the new chairman of this subcommittee, held a brief organizational meeting. A procedure for interlaboratory tests has been written by R. D. Stiehler and should be available at the time of the June meeting.

Requests from various subcommittees for advice on planning and analyzing the results of their experimental work were reviewed.

The need of subcommittee 28 is for more members from the rubber industry who are trained statisticians, and the recruiting of such members is now being undertaken.

SAE-ASTM Technical Committee A

A report on the activities of the SAE-ASTM Technical Committee on Automotive Rubber was presented by J. J. Allen, secretary. Two meetings of this committee were held since the June, 1954, meeting of ASTM, one on September 10 and other on December 10.

The following actions were approved by Technical Committee A:

(1) A revision of SAE 20-R-4, radiator hose specification, to change the tensile strength requirement of class SC hose from 1000 to 800 psi. and a change in the adhesion requirement from six to eight pounds per inch of class R grade 1A.

(2) A revision of SAE 20-R-2, heater hose specification, to provide for addition of class R grade 1A.

(3) A revision of SAE 40-R-2, air brake hose specification, to differentiate between hose that is mandrel built and hose that is non-mandrel built, both types having oil resisting tubes, frictions, and covers.

(4) A revision of ASTM D622-48T, Automotive and Vacuum Brake Hose, to provide for the methods in line with the separation of mandrel and non-mandrel built hose.

(5) A number of revisions approved in SAE 60-R-2, rubber cylinder cups specifications for heavy-duty vehicles.

(6) A revision of SAE 110-R, Recommended Practice for Bench Leakage Test of Automotive Oil Seals for Rotating Shafts.

The major activities of the several sectional committees of Technical Committee A may be summarized as follows: (1) Work is continuing on the study of resilience and hysteresis. (2) A tentative specification on power steering hose and hose assemblies has been prepared. (3) Additional changes are being considered for coolant hose specifications. (4) Several changes are being considered in the rubber compound classification tables in ASTM D735. (5) An investigation is in progress to determine if a single standard transmission fluid for the evaluation of oil seal compounds can be found and what the best procedure is for testing such compounds at 300° F. (6) The latest revision of ASTM D746, Brittleness Temperature of Plastics and Elastomers by Impact, with certain additional changes will be approved. (7) Work is continuing on the low-temperature properties of elastomers, weather aging, and accelerated ozone aging. (8) A revision and reorganization of the present gasket specification are being undertaken. (9) A system for indicating finish standards, particularly as to flash trim, is being developed. (10) Progress is being made on the comparison of abrasion tests against road tests for automotive mats and on the problem of evaluating color changes on light exposure.

ISO TC 45 on Rubber

The American Group for ISO/TC 45 on Rubber under the chairmanship of R. D. Stiehler, reported to Committee D-11 that the ISO General Secretariat submitted six draft ISO recommendations for consideration of ISO member bodies. On the basis of a letter-ballot in the American group for ISO/TC 45, the following suggestions were made to the American Standards Association for formulating the U.S.A. position:

(1) Du Pont Method of Measuring Abrasion Resistance—Draft ISO Recommendation No. 48 is not approved by the United States, but no objection is offered to international standardization by other countries.

(2) Determination of Tear Strength—Draft ISO Recommendation No. 49 is approved subject to minor modifications.

(3) Determination of Hardness—Draft ISO Recommendation No. 50 is not approved and should be considered further by ISO/TC 45.

(4) Determination of the Mechanical Stability of Latex—Draft ISO Recommendation No. 51 is approved.

(5) Rubber-Fabric Adhesion Testing—Draft ISO Recommendation No. 52 is approved subject to minor modifications.

(6) Tensile Stress-Strain Test—Draft ISO Recommendation No. 53 is approved subject to minor modifications.

John M. Reynar, who read a paper before D-11

ASME Founding Anniversary Meeting Hears Bush

The first of five national meetings to be held during 1955 to celebrate the seventy-fifth anniversary of the American Society of Mechanical Engineers was held in New York, N. Y., February 16. The theme of this meeting was "The Engineer and the World of Communications." It consisted of a special commemorative session at the McGraw-Hill Publishing Co. in the morning at which Society President David W. R. Morgan, Westinghouse Electric Corp., spoke on "Mechanical Engineers and Communications" and received greetings from representatives in the several communication fields; an afternoon session at the Engineering Societies Building, featured by a panel discussion on "The Engineer and His Communications"; and a dinner-meeting at the Waldorf-Astoria Hotel, at which Vannevar Bush, Carnegie Institution of Washington, received an honorary membership in the Society and spoke on "Communications—Where Do We Go From Here," and Howard Stewart Bean, National Bureau of Standards, received the 1955 Warner Medal of the Society for outstanding contributions to permanent engineering literature.

Broader Scope Stressed

At the morning session Dr. Morgan pointed out that the place of the first meeting was most appropriate since the meeting to organize the ASME was held in the office of the *American Machinist* on February 16, 1880. He then emphasized that in celebration of this seventy-fifth anniversary, the motto for the year is "By Truth and by Service to Enrich Mankind."

Today the ideal of the founders, to gather, present, and disseminate information, is carried out on a scale that must surely exceed their original expectations. Moreover, at local, at national, and at international levels, engineers today are taking an active part in building contacts and friendships among people of good will in all nations, as they guarantee our engineering strength for defense against aggression in our own nation, it was said.

Who better than an American mechanical engineer can understand that the art and science of better management principles and methods that have brought us our own shared abundance, if they are developed in governments, will stimulate shared abundance among the nations and hasten its appearance, through application of the scientific and engineering contributions of the atomic age, within all nations, Dr. Morgan said in conclusion.

Bush Urges Record Mechanization

Dr. Bush reviewed the tremendous progress that has been made in communication methods in recent years and suggested certain additional improvements, but added that in one exceedingly important phase of the whole problem of communications we are making little progress indeed. This is in the phase of finding in the record the information that we need. To code our scientific literature or our legal documents or any other part of our mounting records and place them under the control of machinery is a stupendous undertaking. It would pay to do the job, no matter how seemingly great the cost, and since it would benefit everyone, the expense should be borne by everyone. Thus it is a task for government, but, he added, the various possible approaches need to be tried out first on a modest scale.

Our hope for the future rests on the gradual spread of knowledge among men and on the assumption that with knowledge will come true wisdom. Communication is the lifeblood of democracy, and we should use every means to spread understanding among men. Any man who works to extend the power and versatility of methods and machines by which one man communicates with another, any man who struggles to bring new ways of communicating into uninhibited effect, can do so with a full conviction that he is laboring for the benefit of his fellow men, Dr. Bush concluded.

Protective Materials Symposium at Akron Rubber Group

A symposium on "Protective Materials for Rubber Products: Antioxidants, Antiozonants, and Waxes" was held by the Akron Rubber Group at its mid-winter meeting at the Mayflower Hotel, Akron, O., January 28. Moderator for the five-member panel was G. Stafford Whitby, director of rubber research at the University of Akron. Six hundred were in attendance.

The panel members and the subjects they discussed included A. M. Neal, E. I. du Pont de Nemours & Co., Wilmington, Del., "General Antioxidants for Synthetic Rubber Products"; G. C. Maassen, R. T. Vanderbilt Co., Inc., New York, N. Y., "General Antioxidants for Natural Rubber Products"; D. E. Baker, Monsanto Chemical Co., St. Louis, Mo., "Antiozonants"; I. E. Cutting, Naugatuck Chemical Division, Naugatuck, Conn., "Waxes"; and A. R. Davis, American Cyanamid Co., New York, "Non-Staining Antioxidants for Dry Compounded and Latex Products."

Following the prepared talks, the panel discussed 40 questions submitted by members of the group. (These will be published in a future issue of RUBBER WORLD.) Edward Gilman, Jr., of the international technical developments branch of the Foreign Operations Administration, introduced to the assemblage the nine members of the second French rubber industry technical mission, now visiting various rubber industry centers in the United States as guests of the FOA.

V. L. Peterson, The Goodyear Tire & Rubber Co., chairman of the Akron Rubber Group, announced that the organization had voted to become incorporated and had appointed L. M. Baker, The General Tire & Rubber Co., a past chairman of the Group, as chairman of a committee to investigate corporate by-laws. Mr. Peterson also announced the appointment of George Hackim, General Tire, to serve out the unexpired term of H. D. Harrington, also of General Tire, as treasurer of the group. Edward Sauser, The B. F. Goodrich Co., chairman of the auditing committee, reported on the satisfactory condition of the Group's finances.

Tom Brown, Goodrich, membership chairman, announced Group membership to be 1,486. R. H. Marston, Jr., chairman of the scholarship committee, introduced the holders of the four scholarships sponsored by the Group at the University of Akron. The students were John Setterfield, James Foght, Thomas Dudek, and James Kreiner. Fred Smith, vice president of Gruen Watch Co., presented an after-dinner speech on his concept of a happy and useful life.

Door prizes were won by Bernard Hewes, Seiberling Rubber Co., and A. Warner, Firestone Tire & Rubber Co.

A symposium on "Textiles and the Rubber Industry" will be held by the Group at the Mayflower Hotel, Akron, April 1, from 2:30 to 4.30 p.m. Panelists will stress the broad uses of textiles in the rubber industry, rather than the fiber chemistry involved. James Farley, formerly campaign mentor to the Democratic Party and now vice president of Coca-Cola International Co., is scheduled to be the speaker for the evening session.

Vinylic Reinforcement of Elastomers Discussed

"Vinylic Reinforcement of Elastomers" was the subject of an address given by Oliver W. Burke, Jr., director of Burke Research Co., Van Dyke, Mich., before the Elastomer & Plastics Group, Northeastern Section, American Chemical Society, meeting at the Massachusetts Institute of Technology, Cambridge, Mass., on January 18.

The concept of such reinforcement was discovered accidentally while Dr. Burke was deputy director of the Office of Rubber Reserve in charge of research and development from 1942 to 1950. During this period the development of cold rubber and of high abrasion furnace blacks was achieved. An offshoot of this work was the realization of the value of structure in auto tire tread reinforcement and an appreciation of how high abrasion furnace blacks and gel formation in cold rubber could lead to the use of vinyls in reinforcement.

Dr. Burke stated that the purpose of this development work was the elimination of the high heat-buildup effects of optimum quantities of carbon black in cold rubber by producing another material that had the reinforcing effects of carbon black in cold GR-S. A vinylic monomer latex mixture of the proper proportions, state of polymerization, and size of particle, and with certain organic groups attached to the surface, was found to meet all the conditions.

Showing electron micrographs of various latices prepared in developing the fine particle-size product needed, Dr. Burke said that a mixture of two or more monomers was finally selected to form the hard, uniform material required. For polar surface treatment, the addition of about 6% of carboxyl groups proved valuable in improving tensile properties and in forming gels.

Co-coagulation with GR-S latex was resorted to, since milling these materials as dried powders into GR-S gave poor results. Gel material was grafted directly on to the particle surface, further improving the tensile properties. With a specific gravity close to one, it was possible to secure and exceed tensile properties with GR-S 1500 that had always required 50 parts of FEF or HAF blacks. Twenty parts of vinylic filler by weight were used, resulting in the same hardness, but with greatly reduced heat buildup.

An amine-type curing agent is needed for this so-called white carbon black, Dr. Burke said. Although the latter is expensive and still rare, adequate amounts of the material are expected to be made available for evaluation in the near future. Its primary value is seen to be in making this country independent of natural rubber supplies for heavy military truck tires, since partial replacement of carbon black loadings reduces heat buildup to a safe level. Dr. Burke closed his discussion by suggesting the possibility of a material that would be impossible to overcure. Developments in the field are limitless, he said.

Villanova Rubber Series

The series of lectures in basic rubber technology being sponsored by the Philadelphia Rubber Group in cooperation with Villanova University, Villanova, Pa., commenced February 7 and will continue until May 23. Held every Monday in Mendel Hall of the University, 7:30-9:30 p.m., the lectures constitute a two-credit course at the graduate level in chemical engineering.

Speakers include B. S. Garvey, Sharples Chemicals, Inc.; O. D. Cole, Firestone Tire & Rubber Co.; P. G. Carpenter, Phillips Petroleum Co.; A. R. Davis, American Cyanamid Co.; John Snyder, Binney & Smith, Inc.; R. B. Sucher, Witco Chemical Co.; Gus Maassen, R. T. Vanderbilt Co.; J. M. Ball, Midwest Rubber Reclaiming Co.; F. McMillen, Shell Development Co.; W. N. Keen, E. I. du Pont de Nemours & Co., Inc.; E. Ahlfeldt, Farrel-Birmingham Co., Inc.; R. H. Wattleworth, The B. F. Goodrich Co.; L. E. Soderquist, The McNeil Machine & Engineering Co.; A. L. Back, Sharples; A. M. Neal, du Pont.; G. Konkle, Dow Corning Corp.; J. S. Jorczak, Thiokol Chemical Corp.; Willard deCamp Crater, Naugatuck Chemical Division, United States Rubber Co.; and others to be announced.

According to A. J. Di Maggio, chairman of the Philadelphia Group's education committee, enrollment for the entire series is about 100. An additional course is expected to be given next year. If the current series is successful, future series will be integrated over two semesters.

Chicago Group Lectures

The complete schedule of its second series of advanced lectures in rubber compounding being given at the John Marshall Law School, 315 S. Plymouth Court, Chicago 4, Ill., has been reported by the Chicago Rubber Group as follows:

February 17, "Economic and Administrative Problems of a Small Rubber Company," H. Boxser, Acadia Synthetic Products; March 3, "Latex and Dipped Goods," F. W. Wilcox, Witco Chemical Co.; March 24, "Hard Rubber," Earl Jones, American Hard Rubber Co.; April 7, "Weatherseals in Automotive Applications," H. A. Winkelmann, Dryden Rubber Division; April 28, "Compounding, Processing, and Application of Automotive Extrusions," W. J. Simpson, Chrysler Corp.

AIEE Automation Conference Slated for April 4, 5

"Automation in the Rubber and Plastics Industries" will be the theme of a two-day conference sponsored by the American Institute of Electrical Engineers' Subcommittee on Rubber & Plastics Industries of the Committee on General Industry Applications. The seventh such conference, it will be held at the Mayflower Hotel, Akron, O., April 4 and 5.

The following is a tentative schedule of events:

MONDAY, APRIL 4

"What Does Automation Mean to a Processing Industry?" Everett S. Lee, General Electric Co. (Keynote address.)

"The Status of Automation in the Rubber and Plastics Industries." G. V. Kullgren, Hale & Kullgren, Inc.

"Electric Drives for Rayon and Nylon Tire Fabric Machines." C. E. Robinson, Reliance Electric Co.

"Comparison of Continuous Thickness Measuring Systems." R. F. Snyder, Goodyear Tire & Rubber Co.

"Automatic Weighing Systems—a Symposium." A. G. Payne, Monsanto Chemical Co.; R. V. Fisch, The Ohio Rubber Co.; R. E. Bell, Toledo Scale Co.; J. C. Williams, Jr., Weighing Components, Inc.; W. M. Young, Richardson Scale Co.

Banquet. (Speaker to be announced.)

TUESDAY, APRIL 5

"Comparison of Electronic, Rotating Regulators and Magnetic Amplifiers." J. P. Montgomery, Westinghouse Electric Co.

"Report of Special Committee on Electrical Equipment in Contaminated Atmospheres." Edwin L. Smith, Firestone Tire & Rubber Co.

"Application and Design Considerations of A.C. Motors in Rubber and Plastics Industries." C. E. Miller, General Electric Co.

"Automatic Control Centers for Industrial Processing." Paul Dickey, Bailey Meter Co.

Inspection Trip to Timken Roller Bearing Co., Canton, O.

Chairman of the local arrangements committee for the conference is R. D. Heyburn, 479 Champlain St., Akron 6, O. W. S. Watkins, The Ohio Rubber Co., Willoughby, O., is chairman of the Subcommittee on Rubber & Plastics Industries.

Philadelphia Group Hears Talks on "Hypalon"

"Hypalon" chlorosulfonated polyethylene was the subject of two talks given before the January 14 meeting of the Philadelphia Rubber Group at The Poor Richard Club, Philadelphia, Pa. The 131 members and guests attending heard S. W. McCune, III, discuss product applications of the material; while O. H. McCollum described its processing characteristics. Both are with E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., producer of "Hypalon."

"Hypalon," resistant to ozone, chemicals, heat, and weather, can be used as coating for such extruded rubber items as weatherstripping, window seals, and refrigerator door seals, Mr. McCune said. Similar coatings may be applied to fabrics. Other applications include floor tile molded of "Hypalon," hose tubes and tank linings, conveyor and elevator belt covers, electrical insulation, and white sidewalls on tires composed of "Hypalon"-natural rubber blends.

"Hypalon" has a relatively low viscosity and high thermoplasticity and does not break down under mechanical treatment, thus permitting rapid mixing and simplifying injection molding, according to Mr. McCollum. These properties also relegate softeners and chemical plasticizers to minor significance, he said. On the debit side of the ledger, he admitted that scorch resistance and curing rate are less readily controlled with "Hypalon" because of the lack of retarders and the limited number of accelerators available, but he foresaw further developmental work clearing away these difficulties.

Officers and directors for the coming year were elected by the Group during the meeting. These included M. A. Youker, du Pont, chairman; L. E. White, Walker Bros., vice chairman; R. J. Salyerds, Harwick Standard Chemical Co., secretary-treasurer; George H. Brannan, Binney & Smith Co., A. J. Di Maggio, Firestone Tire & Rubber Co., and J. R. Mills, Whitehead Bros. Rubber Co., all directors for one year; Philip Noble, Cambridge Rubber Co., and Bertram A. Wilkes, Godfrey L. Cabot, Inc., directors for two years; and R. B. Carroll, R. E. Carroll, Inc., and Henry C. Remsberg, Carlisle Tire & Rubber Co., directors for three years.

Fibrous Rubber Paper Presented by Wade

A paper on "Fibrous Rubber, Its Properties and Potential Uses" was presented by Worth Wade, patent development department of American Viscose Corp., Philadelphia, Pa., before the Connecticut Rubber Group, meeting at the Actors Colony, Derby, Conn., February 18. Co-authors of the talk with Mr. Wade were Ralph M. Winters, Jr., also with American Viscose Corp., and Laurence R. B. Hervey and Derek E. Till, both of the research and development division of Arthur D. Little, Inc., Cambridge, Mass.

Fibrous rubber is a new physical form of rubber consisting of a web formed of a multiplicity of small rubber fibers in random distribution and bonded together at their points of contact, according to Mr. Wade. The web is formed by a modified spray process called fibrillation in which a natural or synthetic rubber is compounded, dissolved in a volatile solvent, and the solution projected into a high-velocity air stream to form fibers which are collected on a moving screen and cured.

Three types of fibrous rubber have been produced in which the fibers are solid and relatively large (Type A), hollow and relatively large (Type B), and very fine and solid (Type C). Mr. Wade presented data reporting the fibers' average diameters, tensile strength, modulus, and elongation, and discussed the density, permeability, compression resistance, tear resistance, tensile strength, and elongation at break of the web.

Potential uses for the new form of rubber include cushions for rugs and carpets and non-skid backings for scatter rugs (Type B); cushion insoles for dress and sport shoes (Type B); surgical goods such as elastic bandages, elastic backing for adhesive tape and strip bandages, and elastic supports for the legs and arms where flexibility is essential (Type A); upholstery and bedding, preferably laminated to sponge or foam rubber to provide tear resistance (Type A).

Also girdles, corsets, brassieres, and elastic inserts for wearing apparel (Type A and C); rainwear where both waterproofness and moisture permeability are desired, such as raincoats and baby pants (Type C); insulation for electricity, sound, shock and heat (Type A and B); semi-permeable membranes for the separation of liquid and gaseous mixtures (Type C); and such narrow elastic articles as belts, suspenders, and garters in which the fibrous rubber is preferably coated with a smooth, continuous coating of rubber (Type A).

Mr. Wade concluded his talk by noting that American Viscose Corp. is constructing a pilot plant at Marcus Hook, Pa., for the production of fibrous rubber. Commercial samples will be available about April 15.

Other activities on the evening's agenda included a social hour; dinner; treasurer's report; a discussion of the cooperation between the Division of Rubber Chemistry, A. C. S., and the Connecticut Rubber Group, by Fred Amon; introduction of John Ball, chairman of the Rubber Division; and the presentation by Dunlop Tire & Rubber Co. of a film entitled "Foam Rubber."

Tlargi Sponsors Memorial Fund

A fund to commemorate its deceased has been organized by The Los Angeles Rubber Group, Inc., in conjunction with the University of Southern California. Specific details of the fund, such as the possibility of establishing a Memorial Scholarship at the University, are still being considered. Tlargi has contributed an initial $500 to the proposed venture and invites donations from individuals and companies. Contributions should be addressed to The University of Southern California Tlargi Rubber Technology Foundation Memorial Fund, c/o Mr. A. H. Federico, The C. P. Hall Co., 1340 E. Sixth St., Los Angeles 21, Calif.

Cab-o-sil Reexamined

Although Cab-o-sil, a colloidal silica produced by Godfrey L. Cabot, Inc., Boston, Mass., was first introduced as far back as September, 1953, newly released technical data should be of interest to rubber technologists.

A white, almost chemically pure silicon dioxide, Cab-o-sil's extreme fineness, high functional external surface area, unusual optical properties, and ease of dispersion have created for it a promising role in such rubber processing applications as a reinforcing agent, thickening and gelling agent, and thixotropic agent.

The silica is so fine, Cabot says, that its external surface per gram covers an area of about 200 square meters. Its value is further supplemented by the absence of any internal surface area, since it is neither gelatinous nor porous. These characteristics make small quantities effective and equalize the cost differentials between it and lower-priced competitive materials.

The properties of the silica differ from precipitated silicas, silica gels, and silica aerogels because of the method of preparation, according to the company. Cab-o-sil is prepared in a hot gaseous environment at a temperature of 1100° C. by vapor phase hydrolysis of a silicon compound, not by aqueous precipitation.

Cabot is particularly optimistic about the use of this product as a reinforcing agent. Compounds containing 22 parts of Cab-o-sil per 100 parts of natural rubber have been formulated to yield tensile strengths of more than 4,000 psi. High reinforcement is also obtained with GR-S, Butyl, and neoprene rubber polymers.

Other virtues claimed for the silica is the imparting to rubber of outstanding tensile strength, high elongation, excellent tear resistance, exceptional hardness at low loadings, minimum plastic flow of so-called green stocks, good dielectric properties for electrical applications, and, in uncured stocks, marked stiffening.

Pertinent chemical and physical properties of Cab-o-sil have been reported as:

Silica content (moisture-free basis)	99.0-99.7%
Free moisture (105° C.)	0.2-2.0%
Ignition loss (1000° C.)	0.2-1.0%
Particle size range	0.015-0.020-micron
Surface area (nitrogen adsorption)	175-200 m^2/gm.
Specific gravity	2.1
Refractive index	1.55
pH (10% aqueous dispersion)	4.5-6.0
Oil absorption (Gardner method)	150 lbs. oil/100 lbs. pigment
Bulking value	0.057 gal./lb.
Apparent bulk density	
Uncompressed grade	2.5-3.5 lbs./cu.ft.
Compressed grade	6.0-6.5 lbs./cu.ft.

Recommended primarily for rubber applications is the compressed grade. The uncompressed variety is intended for the manufacture of paints and plastics. Technical bulletins CGen-1, CMis-1, and CMis-2, dealing with general properties, rubber applications, and aqueous dispersions, respectively, are available from the company on request.

SAE Meeting Papers on Rubber and Rubber Products

At the annual meeting of the Society of Automotive Engineers, in Detroit, Mich., in early January, a paper entitled, "Air and Heavy Vehicle Suspension," was presented by Roy W. Brown, Firestone Tire & Rubber Co., and one on "Self-Leveling Torsilastic Suspension" was given by A. S. Krotz and J. H. Kramer, The B. F. Goodrich Co., and R. E. Houser, Flxible Co.

At the Passenger-Car, Body and Materials Meeting in early March, also in Detroit, J. J. Allen, Firestone, read a paper on "Natural and Synthetic Rubber in the Automotive Industry," and David C. Apps and George M. Vanator, General Motors Corp., presented a paper on "Tire Thump —Its Mechanism and Measurement."

Mr. Brown's paper dealt with the use of an air-spring bellows for heavy-vehicle suspensions, which is a flexible bellows of reinforced nylon tire cord construction that contains air under pressure and is thereby capable of elastically supporting a load. Easy adaptability, flexibility of design and installation, and ability to combine in part the shock absorber function of this bellows result from 20 years of research and offer some intriguing possibilities for the heavy-vehicle suspensions of tomorrow, it was said.

The paper by Krotz, Kramer, and Houser described a recent application of the Torsilastic rubber spring to intercity buses that resulted in greatly improved roll stability, lowered noise level, and reduced maintenance. The weight of the rubber springs on these buses varied between 21 and 33 pounds each.

Mr. Allen reviewed briefly the history of the development of modern synthetic rubbers and showed how the growth in the types of rubber and their applications in the engineering of the modern automobile required the development of adequate specifications in order that the best material for any given application be available as needed.

There is much more to be done, however, since demands are being made for rubber products to function under even more severe conditions, particularly at higher and lower temperatures and with new lubrication and transmission oils. It was indicated that additional new synthetic rubber materials would be available to meet these new demands, as had been the case in the past.

Apps and Vanator presented a comprehensive analysis of the mechanism of tire thump which resulted in the development of a thump meter which may be used to rate tire thump on many cars and evaluate year-to-year progress in controlling this phenomenon. In making this meter commercially available, the authors said it would provide a single uniform standard of tire thump severity for the automotive and tire industries, with the obvious advantages that a common yardstick affords.

Materials Handling Conference, May 16-18

"The Concept of Obsolescence" will be the theme of a three-day conference on new methods of materials handling to keep up with the increasing automation of industrial plants which is to be presented by the American Material Handling Society at the International Amphitheatre, Chicago, Ill., May 16-18, according to Clapp & Poliak, Inc., New York, N. Y., founder and producer of the event, which has made a grant to the American Material Handling Society to underwrite the conference's expenses.

The conference will coincide with the Sixth National Materials Handling Exposition, May 16-20, also to be held at the International Amphitheatre. The show, said to be one of the largest in the country, will demonstrate all types of materials handling equipment under simulated factory conditions. More than 200 companies will exhibit.

In addition to discussing the latest systems and types of equipment for handling materials in the newest automation-adjusted plants, the conference will deal with the handling problems of older plants which cannot move from their present sites.

Topics to be considered cover the wide range of cost reduction; effect of handling on production problems; receiving; warehousing; shipping; containers; palletization; storage patterns; loading and unloading facilities; purchase, leasing, replacement, and maintenance policies; analysis of materials handling problems and its relation to layout and production; water, rail, and over-the-road carriers; as well as yard handling.

Drogin Addresses Tlargi on SAF Dispersion

Isaac Drogin, director of research for United Carbon Co., Inc., Charleston, W. Va., presented a paper, "On Dispersion of Super Abrasion Carbon Blacks," at the technical session of the February 1 meeting of The Los Angeles Rubber Group, Inc., at the Hotel Statler, Los Angeles, Calif. John Pettley, on the faculty of Webb School, Claremont, Calif., addressed the 270 members and guests attending the meeting's regular session on "An Englishman Discovers America."

Dr. Drogin noted that although both SAF and ISAF blacks enjoyed wide usage in tire treads and other industrial goods subjected to high abrasion, there was some difficulty in achieving optimum results in

oil-extended GR-S and crude rubbers, owing either to poor dispersion or procedural problems.

Four types of blacks were selected for comparison—SAF, ISAF, HAF, and EPC. Investigated were such processing factors as mixing time, mixing temperature, remills, methods of preparation, influence of various blends of rubbers, and percentages of loadings. Determining the degree of dispersion resulting from the multitude of changing conditions was arrived at by testing the physical properties of the compounded rubbers.

As a result of the study, Dr. Drogin concluded that the following procedural steps were necessary to effect greater dispersion: longer mixing time for SAF; higher temperatures, up to 375° F., for mixing of ISAF in cold rubber, and lower temperatures for ISAF in oil-extended GR-S, down to 275° F.; blending SAF with lesser reinforcing type blacks; and increasing the percentage of the loadings. Not affecting the degree of dispersion is remilling, and affecting dispersion adversely is separate addition of blacks to the respective polymers and subsequent blending of the stocks.

The group's 1955 Yearbooks were distributed to each member present. Also distributed were engraved metal membership cards to honorary life members and past chairmen. Ten door prizes donated by the Llargi prize fund were won by holders of the lucky numbers.

Silicones at Detroit

Silas Brailey, manager of the technical service laboratory of Dow Corning Corp., Midland, Mich., discussed "Compounding of Silicone Rubbers" before 125 members and guests attending the annual winter meeting of the Detroit Rubber & Plastics Group at the Detroit Leland Hotel, Detroit, Mich., February 4. Featured after-dinner speaker was C. W. Walton, general manager of the adhesive and coating division of Minnesota Mining & Mfg. Co., St. Paul, Minn., whose subject was "Mining Tomorrow's Gold."

Dr. Brailey's paper covered the effect of various types of fillers and reinforcing agents on the properties of silicone compositions and included data on the effects of certain curing systems.

Dr. Walton dealt with the problems facing management in the selection of development projects of the greatest possible long-range benefit to a company and emphasized the need of close cooperation among the sales, technical, and production departments to assure effective introduction of a new product.

J. T. O'Reilly, chairman of the Detroit group, announced the continuation of the organization's educational program in cooperation with Wayne University. The advanced rubber technology class opened February 10, with R. W. Malcolmson, E. I. du Pont de Nemours & Co., Inc., as instructor for the spring semester. The introductory rubber course opened February 11, with S. R. Schaffer, United States Rubber Co., as instructor.

CALENDAR of COMING EVENTS

March 17-19
Division of High-Polymer Physics, American Physical Society, Baltimore, Md.

March 18
Chicago Rubber Group, Inc. Furniture Club, Chicago, Ill.

March 25
Boston Rubber Group, Somerset Hotel, Boston, Mass.

March 31
Rhode Island Rubber Club, Pawtucket Country Club, Pawtucket, R. I.

Southern Ohio Rubber Group, Spring Technical Meeting, Engineers Club of Dayton, Dayton, O.

April 1
Akron Rubber Group, Spring Meeting, Mayflower Hotel, Akron, O. Symposium on Textiles in the Rubber Industry.

New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

April 4-5
American Institute of Electrical Engineers, Subcommittee on Rubber & Plastics, Automation Conference, Mayflower Hotel, Akron, O.

April 6
The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

April 6-10
World Plastic Fair & Trade Exposition, National Guard Armory, Exposition Park Los Angeles, Calif.

April 12
Elastomer & Plastics Group, Northeastern Section, A. C. S. Visit to Quartermasters Laboratories, Natick, Mass.

April 14
Northern California Rubber Group.

Fort Wayne Rubber & Plastics Group.

April 18-21
A.M.A. National Packaging Exposition, International Amphitheatre, Chicago, Ill.

April 20
Washington Rubber Group, Potomac Electric Power Co. Bldg., Washington, D. C.

April 29
Chicago Rubber Group, Inc. Furniture Club, Chicago, Ill.

Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Pa.

May 3
The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

May 3-6
Second International Rubber Quality & Packaging Conference, Essex House, New York, N. Y.

May 4-6
Division of Rubber Chemistry, American Chemical Society, Sheraton Cadillac Hotel, Detroit, Mich.

May 11-13
American Institute of Chemists, Thirty-Second Annual Meeting, Chicago, Ill.

May 12
Northern California Rubber Group.

May 16-20
Materials Handling Exposition, International Amphitheatre, Chicago, Ill.

May 17
Elastomer & Plastics Group, Northeastern Section, A. C. S. Massachusetts Institute of Technology, Cambridge, Mass.

May 18
Washington Rubber Group, Potomac Electric Power Co. Bldg., Washington, D. C.

May 20
Connecticut Rubber Group.

May 30-June 1
Chemical Institute of Canada, Thirty-Eighth Annual Conference, Quebec, P.Q., Canada.

June 2
Rhode Island Rubber Club, Outing, Pawtucket Country Club, Pawtucket, R. I.

June 4
Southern Ohio Rubber Group, Summer Outing, Inland Activities Center.

June 4-5
The Los Angeles Rubber Group, Inc. Summer Outing, Coronado Island.

June 10
Fort Wayne Rubber & Plastics Group, Summer Outing.

June 17
Akron Rubber Group, Summer Outing, Firestone Country Club.

Boston Rubber Group, Summer Outing, Andover Country Club, Andover, Mass.

June 19-23
American Society of Mechanical Engineers, Semi-Annual Meeting, Boston, Mass.

June 24
Detroit Rubber & Plastics Group, Inc. Summer Outing.

August 19
Philadelphia Rubber Group, Annual Outing, Manufacturers' Country Club, Oreland, Pa.

September 22
Southern Ohio Rubber Group, Fall Technical Meeting, Engineers Club of Dayton, Dayton, O.

NEWS of the MONTH

Washington Report and National News Summary

New regulations for the rotation of the government's strategic stockpile of natural rubber issued in mid-February include two changes, as follows: (1) The rate at which the stockpile is being "upgraded" was increased from 5,000 to 7,500 tons a month. (2) An extension from 30 to 60 days for the time in which purchases from the stockpile must be replaced was granted.

In spite of criticism from Far Eastern natural rubber producers, the new regulations were considered to be for the best interests of the United States in that they will provide for attaining a stockpile composed of high-quality, long-storing rubber in a shorter time than before.

At a panel discussion on synthetic rubber plant disposal at the Chemical Engineers Club of Washington it appeared that the prices being paid for the plants represented a very good return to the taxpayer; additional plants may be constructed by private industry around 1957; synthetic rubber prices will be very competitive and not much above the present government 23¢ a pound price; and a shakedown period will be required to determine what the future pattern of distribution between private industry and government research on synthetic rubber will be.

Meanwhile a bill has been introduced in the Congress to give the Disposal Commission another try at selling the copolymer plant at Baytown, Tex., now operated by The General Tire & Rubber Co.

The seven-year-old anti-trust suit between the National Association of Independent Tire Dealers and six tire manufacturers was settled with a consent decree.

Indications regarding new rubber supply and demand in 1955 seem to point toward a higher consumption in this country than previously estimated, with the demand for synthetic rubber increasing at a faster rate than the demand for natural rubber because of the latter's higher price.

Washington Report

By ARTHUR J. KRAFT

New GSA Stockpile Rules Aimed at Higher Quality; Far Eastern Reaction Sharp

The managers of the government owned defense stockpile of natural rubber operate under a double burden. They are required by law and the dictates of common-sense diplomacy to keep their operations from upsetting the industry's market price structure. At the same time they must manage their huge, unwieldy store of rubber—the largest ever to come under a single owner at one time—in an efficient, economical manner, providing the greatest protection for the national security at the least possible cost to the American taxpayer.

Both objectives are attainable, but seldom at the same time. Congress has not hesitated to grumble when it has detected signs of laxity. The big storms, however, are usually set off when the stockpile managers bend their efforts toward more efficient, lower-cost operation. Then a clamor of protest is heard from the natural rubber industry itself—the producers and middle men of Singapore and points west. Constantly worried about this huge foreign-controlled hoard hanging over the market, the natural rubber industry shows its frayed nerves at the first sign that Washington is planning changes in stockpiling policy.

This edginess was again demonstrated last month, when the General Services Administration announced some major changes in the stockpiling program. The reaction from the Far East came swift and sharp. It might have been harsher had not the State Department tipped off the producing countries well in advance as to what was coming. The Department extended itself beyond the normal call of duty. It took the producing countries into its confidence and gave them a complete explanation of the reasons for the impending changes.

New GSA Stockpile Rules

The changes announced by GSA dealt only with procedures for rotating the massive stockpile—winnowing out deteriorating rubber and replacing it with fresh supplies, on a pound for pound basis. There was no change in the total amount of rubber in the stockpile. It will remain at the present figure of some 1,200,000 long tons—a total attained some months ago. The changes in rotation procedures, long expected, were two in number:

1. The rate at which the stockpile is being "upgraded" was stepped up by 50%. As before, there will be no limit on the amount of rubber GSA will be able to replace in any month to prevent deterioration in the stockpile. The only limit will be on the amount of "non-specification," generally low-grade rubber, which can be weeded out for replacement with higher-grade "specification" types. Specification grades are those which our military planners have decided are desired for the permanent stockpile. The non-specification grades are those they have deemed unacceptable for stockpiling.

A good deal of low-grade rubber was purchased for the stockpile in years past, particularly during the spectacular stockpile build-up of 1950-52. The upgrading program is designed to weed out these

supplies, as rapidly as conditions permit. The ceiling on upgrading transactions was raised last month to 7,500 tons a month. It had been 5,000 tons a month since May.

2. An extension of the time in which purchases from the stockpile must be replaced was granted. Under the rules which were in effect since last May, manufacturers and dealers had to replace the rubber bought from the stockpile in the same or the succeeding month. When GSA released rubber from its stockpile to a manufacturer, it generally insisted on receiving delivery of its replacement within the next 30 days.

"This period," the agency said, "proved too short to permit suppliers to order replacement material from Far Eastern producing areas. Manufacturers and dealers were unwilling to participate in the rotation program except on a 'fill-in' basis that did not provide the volume of transactions necessary to keep the stockpile from deteriorating."

Under the new rules the suppliers will have an extra month—60 days in all—to deliver the replacement. This additional time was granted, however, only for replacing rubber taken from the stockpile in the same month or the month following the purchase contract. When a manufacturer orders stockpile rubber for delivery two, three, or four months hence, GSA will still insist on having the replacement lot in its hands within 30 days after making delivery.

GSA made no bones about the hindrance that the flat 30-day replacement rule imposed on its ability to carry out a sufficient volume of rotation transactions. It was insufficient to prevent deterioration of the stockpile. The agency had figured on a monthly rotation volume approaching 10,000 tons, including the 5,000 tons it was permitted to replace with higher, longer-storing grades. Manufacturers and dealers, however, found that to get the replacement shipment into GSA's hands within 30 days, they would have to rush their purchases at the market, paying premium prices. This they were unwilling to do. As a result, GSA's rotation program slipped badly behind schedule. In most months since May, the agency was barely able to rotate 5,000 tons; the amount that was upgraded during this period was even lower.

Far East Reaction Sharp

Despite the careful efforts of the State Department to arrange for simultaneous announcement of the full story of the new rotation procedures in Singapore and Washington, a somewhat generalized and garbled version prematurely leaked out in the Far East. The Singapore market—riding high for many months—tumbled sharply. The decline slowed somewhat after the text of the GSA announcement was made available on February 16—five days ahead of its scheduled release date. While the changes were a good bit more moderate than the wild rumors had it, they were still far from comforting to the natural rubber industry.

The extra 30 days for replacement came in for particularly sharp criticism in the Far East. In the words of Holiday, Cutler, Bath & Co., Singapore rubber brokers:

"It is obviously a tremendous weapon in the hands of bear operators to be able to borrow from the stockpile, satisfy immediate demand, and be able to sit back and buy from producers and consumers at leisure. The stockpile was never meant for this purpose and is being used again in such a manner that the political repercussions in Southeast Asia may be such as to shake all faith in the purity of American intentions and value of their statements. It will be easy, but too late, to be wise after the event. A recession in the ordinary way would take place in an orderly manner, and it is the height of folly politically to do anything on which blame may be laid for precipitating this in a disastrous manner."

GSA Policy Explained

The increase in the monthly upgrading rate to 7,500 tons—the other major change in the rotation program—"has as its objective," GSA said, "the movement of a maximum quantity of deteriorating material out of the stockpile before the Summer of 1956, summer being the season of most rapid deterioration." Informed sources put the amount of stockpiled rubber requiring replacement within the next 15 months at between 100,000 and 150,000 tons (15 multiplied by 7,500 is 112,500). If the figure is closer to 150,000 tons than 112,500, some of the rubber sold from the stockpile in coming months will be replaced with non-specification grades.

A new specification schedule issued by defense officials February 10 reclassified several middle grades which previously had carried a "specification" rubber tag. These rubbers—1, 2 and 3 Ambers, 1 and 2 Browns, and 4 and 5 Ribbed Smoked Sheets—have now been designated as "temporary specification" grades. GSA can purchase them for replacement without charging such purchases against the 7,500-ton ceiling on upgrading. Previously they had to be counted against the 5,000-ton upgrading ceiling in effect since last May.

All of this spells a new determination on the part of GSA, with the assent and support of other federal agencies and U. S. dealers and manufacturers, to—in the words of GSA Administrator Edmund F. Mansure—"concentrate on reaching the final objective (of the stockpiling program) in terms of quality." The total objective in terms of quantity, he noted, "has been reached." GSA wanted to get on with this job in speedy fashion a long while back—in mid-1953, as a matter of fact, when the stockpile target—in terms of quantity—had been substantially attained. The free-wheeling rotation practices instituted by GSA at that time, however, brought a deluge of protest from overseas as well as from dealers, manufacturers, and Congressmen here. The reins were slapped on in December, 1953, when a flat 5,000-ton a month ceiling was invoked for *all* rotation transactions. It took another six months before GSA's protests brought some loosening in these restraints to the extent of applying the 5,000-ton ceiling to upgrading rotation transactions only.

Concurrent with the speed-up in squeezing the lower-grades out of the stockpile, defense officials made some decisions on the ticklish question of whether the ultimate stockpile goal should allow for some lower-grade rubber, of relatively brief storability—say 10 to 30% of the total stockpile. There was never any question of the desirability of having a heavy proportion of higher-grade, long-storing rubber in the stockpile. Rather, it was a question of degree. The new specification schedule issued February 10 makes clear that the decision has been cast in favor of eliminating completely the lower grades (and any others) requiring frequent rotation.

When this "quality" objective is finally attained (this will take another couple of years), this country will have a defense stockpile composed practically entirely of the four top grades of Ribbed Smoked Sheets—IX, 1, 2, and 3 RSS—as well as a small quantity of latex crepes. Thus the composition of the stockpile will provide room only for the so-called hard rubbers (except for the latex crepes) and none for the soft rubbers.

Possible Market Effects

The incidental effect will be to release on the market substantial quantities—at least 7,500 tons a month if present plans work out—of the softer rubbers produced by smallholder farmers, and replace these with the higher-quality rubbers produced chiefly on the more up-to-date and generally European owned estates. Malaya and Ceylon are in the best position to benefit from this program; while Indonesia and Thailand—producers of soft rubbers—will find the stockpile competing as a "supplier" of the rubbers they sell to consumers here. Of course the tire producers, who account for the bulk of U. S. rubber consumption, use a good deal more middle and lower-grade crude rubber than they'll be able to get from GSA. GSA, in its announcement of the new rotation procedures, indicated its continuing desire to avoid widening the differentials between grades "abnormally."

Justification for New GSA Rules

U. S. interests—defense and economic—provide the justification for heavier emphasis on attaining a stockpile composed of high-quality, long-storing grades. Synthetics have been improved in recent years to the point where they may take over from natural rubber in all but a narrowing range of applications where higher grades of natural rubber are still deemed essential. Thus there is no longer a military—or wartime technological need—of lower grades of natural rubber.

The economic justification lies in the high costs of rotating. For instance, IX RSS, according to GSA, will store without deterioration "for upwards of 20 years"; whereas Flat Bark deteriorates after approximately one year in storage. The cost of each rotation transaction is about 2¢ a pound. Thus a stockpile composed entirely of Flat Bark over a 20-year period would run up a bill of some 40¢ for each pound in rotation charges alone. In contrast, the cost of maintaining a stockpile made up entirely of IX RSS would entail a rotation charge of 2¢ a pound over the same period. These are extreme examples, but they illustrate the advantages, in terms of reducing the taxpayers' burden, of developing a stockpile of long-storing grades of rubber.

Bill for New Negotiation on Baytown Plant Appears; Washington Engineers Discuss Disposal

Contracts for the sale of 24 government synthetic rubber plants to private industry are now before Congress—which has until March 27 to decide whether to let the sales program go into effect or snuff it out through a veto resolution. At this writing the review period is at its midway point, and there's been scarcely a peep of protest raised about the terms of the disposal program laid before the legislature at the end of January by the Rubber Producing Facilities Disposal Commission.

Instead, the reaction has been one of almost universal praise—at least outside of Congress. Newspaper editorials have been unstinting in complimenting the Commission for the job it did in handling the difficult burden of developing a program that would result in a "full, fair value" return to the taxpayer, establish private competition in synthetic rubber on terms to foster free competition and to protect the national security, which must rely on a progressive, research-minded, and large synthetic rubber industry.

At Capitol Hill the legislators have not yet spoken up publicly. Privately, however, assurances of support for the disposal program have come from the leaders of the Democratic Senate and House—Senate Majority Leader Lyndon B. Johnson and House Speaker Sam Rayburn. Most of the government rubber plants are located in Texas, from which both of these powerful legislators hail. Neither of the committees which have jurisdiction over disposal had announced any definite plans for hearings as the review period passed its midway point. The House Armed Services committee, however, is expected to hold a one-day hearing on March 10 to review the program with members of the Disposal Commission.

Baytown Plant Bill

The only legislation to appear so far has been a bill to give the Disposal Commission time for another try at selling the 44,000-ton copolymer plant at Baytown, Tex., now operated by General Tire & Rubber Co. The Commission and General Tire—sole bidder for the property—were unable to agree on a satisfactory price during the seven-month period in which negotiations took place, a period which ended last December 27. As a result, the Commission has recomended that this plant be placed in stand-by when the others are turned over to private ownership. The resolution for renewed negotiations—with General Tire or others—would give the Commission 30 days in which to sell the Baytown plant. This period would start with the date of enactment of the bill, which was introduced in the House by Representative Albert Thomas (Dem., Tex.), in whose district the plant is located, and in the Senate by the two Texas Senators, Price Daniel and Johnson. They have given assurances to the Commission that while anxious to have the Baytown plant kept from "mothballs," they would not let the fate of Baytown influence consideration—on their merits—of the contracts covering sale of the 24 other facilities, with an aggregate production capacity of 689,400 tons of GR-S and 90,000 tons of Butyl.

Plant and Rubber Prices; Research

With one eye on Congress, the rubber community began to turn serious attention to what disposal of the 12-year-old government synthetic rubber monopoly holds in store for the future. The Chemical Engineers Club of Washington stepped in to help clarify the picture by inviting four experts to address a special dinner-meeting before an invited audience of businessmen and scientists on February 15.

The four-member panel was set up by Raymond E. Ewell, of the National Science Foundation. Chosen as moderator was Walter J. Murphy, editor of industrial publications for the American Chemical Society. The panel members were: John P. Coe, vice president, United States Rubber Co.; John Tatum Cox, Jr., of the Washington chemical engineering consultant firm of Cox & Weinrich; F. M. Simpson, vice president, Petroleum Chemicals, Inc.; and Joseph H. Faull, Jr., professional consultant.

Dr. Murphy opened the meeting with a tribute to the Disposal Commission and a recitation of the history of the synthetic rubber program. He commented that the Commission was given "an exasperatingly vague mandate" by the Congress, when it wrote into the legislation that the plants were to be sold for "full, fair value." The opening statements of the other speakers, and their responses to questions from the floor, fell under several broad categories:

Contract Prices and Other Terms

Mr. Coe noted that the $259 million price attained for the capital assets of the facilities will return, in the Commission's view, 96.6% of the taxpayers' unrecovered investment since the start of the program.

"The taxpayer," he said, "is coming out a lot better than 100%. A lot of war experience has been charged against this program. No one expects private industry to pay for all of this any more than one would expect it to pay for battleships."

Mr. Coe also paid tribute to Jesse Jones, of the RFC, who first pressed for construction of synthetic rubber plants; to the Senate war investigating committee headed by then-Senator Harry Truman, for consistently accurate reporting on the nation's rubber security problem from the start; and to the civilian committee headed by Bernard Baruch, for publicizing the need of synthetic rubber plants.

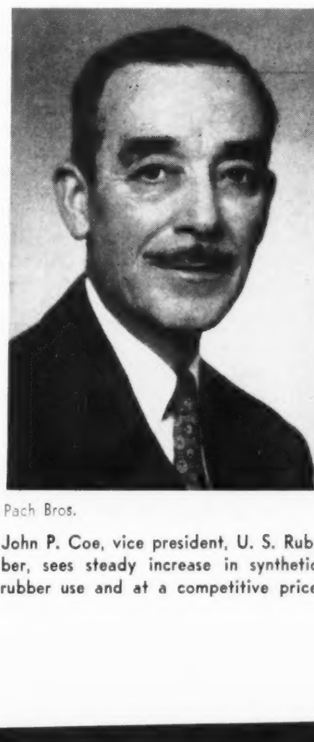
As for the Disposal Commission, Mr. Coe said, "It did a really wonderful job in getting 'full, fair value' for the plants. They really went to work on us."

Dr. Faull deplored the failure to sell the Baytown copolymer plant as "an unfortunate accident." The plant, he said, "will be needed in the economy for the next few years." He said this is a profitable plant and hoped that the government would find an opportunity of trying to get someone interested in buying it.

Dr. Cox said the Commission received a good return on the facilities. The cost of erecting new facilities, he said, is $140 per ton for a copolymer plant, including the cost of land and off-site development. The Commission, he stated, came close to this figure for the larger plants. A modern butadiene plant, he declared, can be put up today at a cost of $250 per ton of capacity, using butane, which is now in ample supply and will be "flooding" the market in the next decade.

Mr. Simpson, whose firm purchased a butadiene plant, said the return received by the Commission on the four largest butadiene plants actually exceeded the replacement figure. He listed the return as ranging from $279 per ton on one plant to $254 on another, with the two others falling between at $259 and $269. Their operators, he said, will be "reasonably even on a competitive basis."

"The government," Mr. Simpson said,



Pach Bros.

John P. Coe, vice president, U. S. Rubber, sees steady increase in synthetic rubber use and at a competitive price

Chase, Washington

John T. Cox, Jr., Cox & Weinrich, consultants, thinks price for copolymer plants close to cost of replacement

Sargent Studio

J. H. Faull, Jr., consultant, reports shakedown period required for industry *versus* government research

"got a particularly good deal on price especially in relation to disposals in times past. The Commission did a very fine job."

He termed its method of determining "full, fair value" on the basis of potential earning power of the facilities "unorthodox," but said it resulted in sale prices much higher than bidders had planned on paying.

"We're not going to make the money on the plant we bought that we thought we would," he asserted.

The Commission, he said, also met the other "basic precepts" of the disposal law.

"Small business needs will be met, and there's a good scattering of ownership in all three major groups of plants."

Future Supply

Mr. Coe saw an "upward growth curve for synthetic rubber for the next ten years" and expressed the opinion that additional synthetic rubber plants will be needed to meet consumer requirements after 1957. He saw no cause for concern, however, that we might run short on capacity in the future.

"Private industry," the U. S. Rubber executive declared, "will provide additional plants as needed."

Each company will find the incentive to do this in its "competitive desire to hold one's own" position in the industry. Mr. Coe saw no prospect of natural rubber production exceeding 1,800,000 tons a year over the next decade.

Dr. Cox felt that small users are assured of adequate supplies through provisions of the sale contracts requiring each operator to make available specified portions of his output at reasonable prices to small firms. It will take several years, however, he predicted, to give each small user the type of GR-S he wants and needs. Many of the GR-S polymers sold today by the government have been tailor-made. They are produced in too small a volume and at too high a cost to appeal to private operators. The new operators of the plants, he predicted, will give much attention to the special needs of small customers—each manufacturer maintaining a "large technical service department" for this purpose.

"I am confident," said Dr. Cox, "that private industry will solve this problem."

Rubber Prices

Dr. Faull noted that the rising living standard in Asia is raising labor costs, and that this increase will mean that the price of natural rubber will remain higher than that of synthetic rubber.

"It will always leave room for competition from synthetic rubber under private ownership."

Mr. Coe predicted that "the selling price of GR-S will be determined by competition. Someone will set a price, and others will have to meet it. If anyone can't make a return on that price, it will be too bad for him." He mentioned that several plant purchasers already have set prices close to those charged by the government.

[The government sells GR-S for 23¢, plus a uniform freight charge of 1.1¢, bringing the total to 24.1¢ a pound. Phillips Chemical has announced a 25¢ delivered price for GR-S produced at the 63,000-ton-a-year Borger, Tex., plant — only nine-tenths of a cent higher than the government's price. Firestone Tire & Rubber Co. and Shell Chemical Co. are offering GR-S at 23¢ a pound, f.o.b. producing plants. These offers cover the output of the Firestone plant at Lake Charles, La., a 99,600-ton unit, and Shell's 89,000-ton copolymer plant at Los Angeles.]

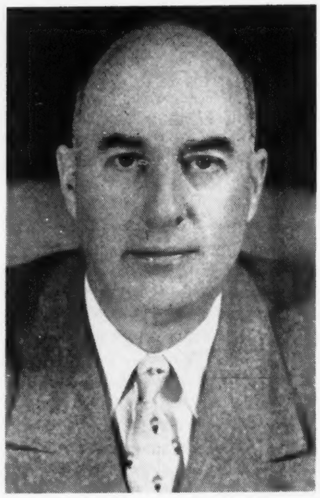
Research

The future of research proved a controversial subject, at least as to the government's role in the picture.

Dr. Cox was emphatic in his view that "we've lost nine years in basic research. We face a grim task ahead." He contended that the spur of competition is needed to produce results in research, and "Competitive research cannot take place under government ownership" of the industry. With the plants going over to private ownership, he forecast, "Competitive research in a remarkably short time will give us a synthetic rubber that can make a heavy-duty auto and bus tire"—one of the chief goals of the government's research program over the past few years.

Dr. Faull agreed that the research effort "has not been completed. From the point of view of national security—the military's needs—there is still a lot of unfinished business." Private industry he said must take on the responsibility of providing more underlying basic research. He pointed out, however, that the Defense Department has an equity in the university research program and will insist that nothing interrupt these efforts to develop special polymers suitable for high- and low-temperature performance. The future of the university research program—representing about $1 million of the $5 million government rubber research expenditure this past year—will be placed before the National Science Foundation for study and recommendation, under a proposal of the Disposal Commission.

"A major objective of industrial research in the next few years could be to come up with a full-scale replacement for



Edmund F. Mansure, GSA Administrator, emphasized need of stockpile upgrading

natural rubber. The government has a stake in this matter because of the heavy expense of maintaining the natural rubber stockpile," Dr. Faull declared.

"It may require a shakedown period of a few years before a recognizable pattern emerges—where we can find what government and university research will be needed and what can be fitted into the pattern of private competitive research."

Continued operation of the government laboratory at Akron, he contended, will not affect the competitive research of private industry. Even the larger tire companies, he noted, are in agreement that the University of Akron should continue to run this laboratory and provide some service to companies too small to carry on a full range of necessary research.

Mr. Coe said, "I am personally extremely strong for limiting government research and organizing privately managed research under the stimulus of competition."

He agreed, however, that the Defense Department still has problems requiring further research on rubber.

"We must remember," he cautioned, "that we need an objective for research."

There must also be an incentive, he declared. This was provided in wartime by the need "to save our necks—to keep the enemy away from our shores. But without war, we still need an incentive—and the best incentive is competition."

Consent Decree for NAITD and Tire Makers Suit

Federal Judge Richmond B. Keech signed a consent judgment in February bringing an end to the seven-year antitrust suit filed against six tire manufacturers by the National Association of Independent Tire Dealers.

The decree, entered in Federal District Court for the District of Columbia, culminated more than five years of negotiations looking toward settlement of the case. The original complaint, filed in 1948, contained two counts. One, in action for treble

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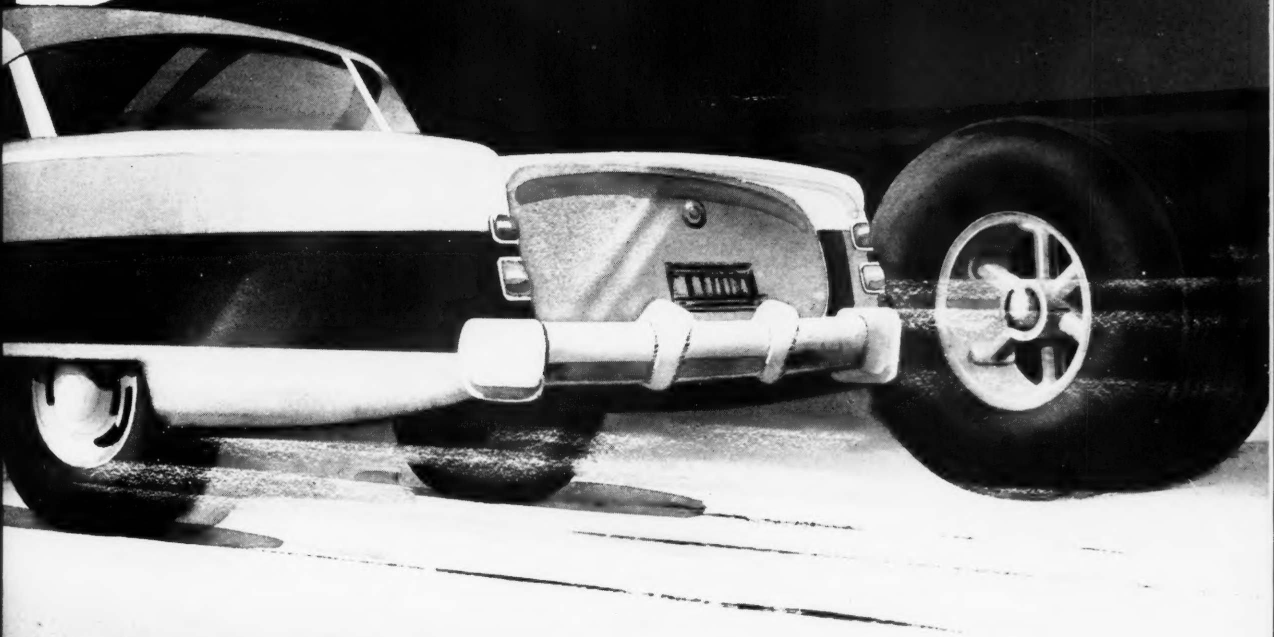

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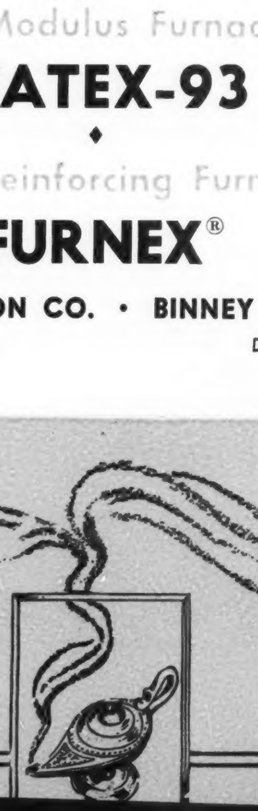


damages, was settled in 1952 when the defendants agreed to pay $75,000 in cash to NAITD and to place $49,500 worth of advertising in NAITD publications.

The second count was trimmed down at this time by dropping charges of conspiracy to violate the anti-trust laws, thus confining the suit to charges of violation of the Robinson-Patman price discrimination act. Under the settlement of count two disclosed last month, the tire companies will no longer enter any new mileage rental arrangements for supplying tires to small local bus and taxicab operators, when these operators are able and willing to rent their tires from other suppliers.

The decree also requires the six manufacturers to permit state government agencies with whom they have tire sales contracts to take local delivery from independent tire dealers and other local tire distribution outlets and permit these outlets to earn commissions on this business.

The consent judgment was entered on a six-month trial basis. Should any party withdraw from the agreement within this period, it will be up to Judge Keech to decide on further action. The six tire manufacturers named in the suit are Firestone Tire & Rubber Co., United States Rubber Co., General Tire & Rubber Co., The B. F. Goodrich Co., Goodyear Tire & Rubber Co., and Lee Rubber & Tire Corp.

RMA Opposes Reciprocal Trade Bill

A statement in opposition to the three-year Reciprocal Trade Agreements Act extension bill was made on February 3 before the House Ways and Means Committee by C. P. McFadden, chairman of the footwear division of The Rubber Manufacturers Association, Inc.

As a representative of 14 American manufacturers of rubber footwear comprising the RMA footwear division, Mr. McFadden emphasized that while he spoke in opposition to H. R. 1, he endorsed the announced aims of the measure, the promotion of world trade. He said it could be used to increase imports into the United States and thereby improve the economic position of some foreign manufacturers, but if these imports merely displace American labor, where is the gain in world trade?

American footwear manufacturers are concerned that the broad delegation of power in H. R. 1 would ultimately put the responsibility for tariff decisions in the hands of persons who are remote from the manufacturers and workers who would be adversely affected by tariff reductions.

In conclusion it was emphasized that United States tariffs are not a deterrent to expanding world trade; nor would the elimination of the remaining American tariffs bring the prosperity we enjoy to all the nations of the world.

H. R. 1 was reported favorably by the Committee, however, and adopted without change over the strong objections of protectionist Congressmen. It is now before the Senate Finance Committee, where further hearings are expected.

Rubber Consumption To Be Higher in 1955?

An indication that the rubber industry in this country was considering revising upward its estimate of new rubber consumption for 1955 from 1,255,000 long tons by as much as 75,000 was revealed at the panel discussion on the synthetic rubber plant disposal program at the meeting of the Chemical Engineers Club in Washington, D. C., on February 15. The RMA estimate of 1954 new rubber consumption of 1,205,000 tons on January 1, 1955, has since been found to be quite a bit lower than the actual 1,232,718 tons consumed.

In its release of February 21 the RMA gave a figure of 125,666 long tons of new rubber consumed in January, 5.9% above December, 1954, consumption. Natural rubber consumption in January increased to 57,299 tons, but the ratio of natural rubber to total new rubber consumed decreased from 46.5% in December to 45.6% in January.

Synthetic rubber use increased 7.7% in January to 68,367 tons, and consumption of reclaimed rubber increased to 25,506 tons, or 5.1% above the December figure.

National News

Rubber Supply Called Adequate

The rubber industry is assured of plentiful supplies of new rubber in 1955 because of a higher rate of production of natural rubber and substantial increases in the use of synthetic rubber by foreign countries, according to a statement made in early February by Lee R. Jackson, president of the Firestone company.

As a result of an analysis of estimated new rubber requirements in 12 countries where Firestone operates plants, it was found that foreign countries are planning to use 30% more synthetic rubber in 1955 than in 1954. This increase was viewed as just the beginning of a movement toward greater utilization of the superior qualities of LTP GR-S in passenger-car tire treads.

Present indications are that the rubber industry in the United States will use 750,000 tons of synthetic rubber in 1955, which is 115,000 tons more than was used in 1954. [The 750,000-ton figure is also 60,000 tons higher than the RMA estimate the beginning of the year.—EDITOR.]

The trend toward the use of greater amounts of synthetic rubber by manufacturers of rubber products throughout the world is also accelerated owing to synthetics ready availability and lower price, it was said. A world surplus of natural rubber over consumption requirements for 1955 was predicted.

Also, John L. Collyer, chairman of the Goodrich board, in a statement made at about the same time, foresaw a sharp decline in natural rubber's share of the United States market in coming months.

The reason for the decline in natural rubber's proportion of the total U. S. market, Collyer said, is the continuing high price of crude natural rubber, which is now approximately 50% higher than the price of GR-S.

The trend of switching from natural rubber to GR-S will be accelerated, and the former's share of the United States market may shrink to as low as 35%, he added.

Goodyear Signs New URWA Contract

Negotiations for a new working conditions contract, which began on January 11 between Goodyear and the United Rubber Workers of America, ended on February 10, when an agreement on a new two-year contract was reached. The agreement has still to be approved by the several local Goodyear unions and the international union's executive board.

Although complete details on the new contract are not available, some of the points covered include make-up pay for jury duty; a more liberal vacation policy in connection with laid-off workers, which permits tying two years' vacation period together under certain conditions; a nonliability clause for the union in unauthorized work stoppages; and continuation of the union shop clause in states where it is not banned by law.

Wages, however, were not a part of these negotiations.

Meanwhile, talks aimed at new contracts continued between General Tire and the URWA and Seiberling Rubber Co. and the URWA, where in both cases the present contracts expire on March 1.

The Goodyear Akron local union approved the above-mentioned company-wide contract on February 20.

Tire Prices Increased Again by Manufacturers

Increased prices for natural rubber and other higher costs were given as the reasons for advancing the prices of passenger-car, truck, and industrial tires in mid-February by the B. F. Goodrich Co. and several other tire makers.

Passenger-car tires, all types, were advanced 2½%; all commercial and small sizes of truck tires through 7.50 cross-section, 2½%; all large truck and off-the-road tires, 8.25 size and larger, 5%; and all industrial solid and pneumatic tires, 7½%.

In addition, manufacturers of recapping stock increased the price of the natural rubber stock 6¢ a pound and the LTP GR-S stock 2¢ a pound. All tire repair materials were increased in price 12½%.

This is the third increase in tire prices since November, 1954. It was at that time that the United Rubber Workers, CIO, had just negotiated a 6½¢-an-hour wage increase, and other costs, particularly the price of natural rubber, had just started to climb. Natural rubber has now increased almost 50% in price over the November, 1954, figure, and it is used in larger amounts in the truck tires, thus the higher percentage increase for these tires.

Other Industry News

RTA of N. Y. Celebrates Fortieth Anniversary at Annual Dinner-Meeting

The Rubber Trade Association of New York, Inc., celebrated its fortieth anniversary at its annual dinner-meeting in the Hotel Biltmore, New York, N. Y., February 24. In addition, the Association dedicated this meeting to honoring six of its members who had spent 50 years or more in the rubber industry. An attendance of about 300 members and guests heard W. C. Armstrong, director of the Office of International Trade & Resources of the U. S. State Department; J. R. Blanford, counsel for the House Armed Services Committee; and W. James Sears, vice president of The Rubber Manufacturers Association, Inc., make short talks. R. D. Young, president of the RTA, presided and introduced the speakers and other invited guests.

A cocktail party preceded the dinner-meeting, and an orchestra and singers entertained during dinner.

Mr. Young first paid tribute to the late Rep. Paul Shafer and his wife, referring to Shafer as one of the best friends and most devoted workers for the good of the rubber industry and the nation in the Congress that the industry ever had. The audience was asked to stand for a moment of silent tribute for Shafer and his wife.

After mention of the Association's fortieth anniversary, it was explained that the organization had 65 members with more than 35 years of service, 54 with more than 40 years, 18 with more than 45 years, and six "elder statesmen" with more than 50 years of service in the rubber industry. Three of these men, R. L. Chipman, Ross-Adler Co., with 57 years of service; James C. Baldwin, Joosten & Janssen, with 53 years; and Herman Muehlstein, H. Muehlstein & Co., Inc., with 53 years, who were seated at the speakers' table, were introduced and presented with mementos of the occasion. Frank B. Ross, Ross-Adler Co., with 58 years' service; Robert Badenhop, Robert Badhenhop Corp., with 53 years; and Marcus Rothschild, Rothschild & Co., with 51 years, could not be present, but communications from the last two were read by Mr. Young.

Mr. Armstrong thanked the RTA and its members for the help provided the State Department by private industry in connection with international affairs concerning rubber, with special reference to the help of Mr. Young and others as advisors at meetings of the International Rubber Study Group. This speaker also mentioned the joint efforts of the RTA and the RMA in trying to improve standards of quality and

Speakers' table at RTA annual dinner-meeting, Hotel Biltmore, New York, February 24: *left to right:* Fred Pusinelli, Fred Pusinelli & Co.; W. J. Sears, RMA; J. S. Cornell, J. S. Cornell Corp.; J. R. Blanford, House Armed Services Committee; J. C. Baldwin, Joosten & Janssen; R. L. Chipman, Ross-Adler Co., Herman Weinstein, Paul Elbogen & Co.; R. D. Ycung, RTA president and toastmaster; F. J. Jackson, Hecht, Levis & Kahn; S. J. Pike, S. J. Pike & Co.; Herman Muehlstein, H. Muehlstein & Co.; W. C. Armstrong, U. S. State Department; Alan L. Grant, Alan L. Grant & Co.; W. Rothschild, M. Rothschild & Co.

packaging for natural rubber as lightening the burden of government responsibility in this field.

Mr. Blanford expressed his very deep appreciation of the tribute paid to the late Paul Shafer, who as a member of the House Armed Services Committee, devoted the last days of his life to the synthetic plant disposal program because of his firm conviction of the necessity of transfer of the plants to private industry. It was revealed that the Committee had scheduled hearings on the disposal program for March 10 in Washington. Mr. Blanford said he would make no predictions or prophecies regarding Congressional action, but that if the plants are turned over to private industry, most credit should go to Shafer.

Mr. Sears said the year 1955 should see really free and complete competition between natural and synthetic rubber in the United States for the first time. He reminded his listeners how the RTA and the RMA had worked together in the past on matters of mutual concern, and, in bringing greetings from the new RMA president, Ross Ormsby, he stated that he expected the cooperation between the two associations would be even greater in the future.

Other invited guests, including Arthur Wolf, Office of Defense Mobilization; E. D. Kelly, Office of Synthetic Rubber; Osgood Tracy, Standard Oil Co. of N. J.; W. S. Lockwood, W. S. Lockwood, Inc.; H. C. Bugbee, Natural Rubber Bureau; E. G. Holt, Business & Defense Services Administration; M. E. Lerner and R. G. Seaman, editors of *Rubber Age* and RUBBER WORLD, respectively; and P. S. Trenbath, retiring counsel of the RTA, were introduced by Mr. Young; then the meeting adjourned.

Licenses Dustless Method For Banbury Mixing

Eight American rubber and chemical manufacturers are currently licensees of a patented method for the dustless addition of compounding materials in miscible polymer packaged form to rubbers in a Banbury mixture, according to Paton-Chandler Process Co., Detroit, Mich., co-holder of the patents with Standard Oil Development Co., New York, N. Y.

The patents, Nos. 2,617,775 and 2,617,-782, granted in 1952, describe how powdered ingredients of the mixture, such as carbon black, vulcanizing and accelerating agents, and other active and inert ingredients, may be added to the Banbury without loss and without contaminating the surrounding atmosphere.

This result is achieved by packaging the material in a container made from a substance that will enter into and become an integral part of the Banbury mixture or will remain inert and not affect the properties of the mixture. The container must be capable of blending with the mixture, physically or chemically, at the compounding temperature.

Recommended container materials include natural, synthetic, or reclaimed rubber, Thiokols, and numerous thermoplastic products such as Saran, Polythene, Pliofilm, and copolymers of vinyl chloride and vinyl acetate.

Latest to be licensed under the patent is United States Rubber Co. Others that have been licensed are Firestone Tire & Rubber Co., The B. F. Goodrich Co., Armstrong Cork Co., Merck & Co., Godfrey L. Cabot, Inc., Philip Carey Co., and General Magnesite & Magnesia Co.

Union Carbide to Help Build Italian Synthetic Rubber Plant

Union Carbide & Carbon Corp., New York, N. Y., has contracted to act as consultant to help design and build a \$75,000,000 synthetic rubber plant for Azienda Nazionale Idrogenazione Combustibili (A.N.I.C.) at Ravenna, Italy, according to a joint statement issued by Morse G. Dial, president of the American firm, and Enrico Matei, president of Ente Nazionale Idrocarburi (E.N.I.), parent company of A.N.I.C.

Union Carbide will furnish consulting and management assistance in planning, designing, constructing, and beginning operations for the new Po Valley plant. Expected to be completed in about two years, the plant will primarily produce butadiene from natural gas for the subsequent production of 30,000 tons of GR-S type of synthetic rubber and 350,000 tons of nitrogen fertilizers per year.

Particularly significant in the contract, the statement says, is that Union Carbide will allow A.N.I.C. to use its process to produce acetylene from methane and butadiene from acetylene through the intermediate production of acetaldehyde and alcohol.

In 1943, during World War II, the Union Carbide process produced more than 75% of all the butadiene made in the United States. In 1944 the process netted about 64% of butadiene production, despite progress made with other methods. Union Carbide built three large plants to utilize this process—at Institute, W. Va.; Louisville, Ky.; and Kobuta, Pa.—with a total annual butadiene production of 210,000 tons.

Also to be put into operation at the Ravenna plant will be Union Carbide's more recently developed process for making acetylene from natural gas. This method employs a partial oxidation process involving the high-temperature reaction of methane and oxygen. It has been in commercial operation at the company's Texas City, Tex., plant since early 1951.

Both of these processes are said to be ideally suited to the resources and capabilities of the Italian firm. Ente Nazionale Idrocarburi produces more than 100 billion cubic feet of natural gas each year, or 90% of the total natural gas extracted in Italy, making that country the greatest producer of the material in Western Europe.

More Polyurethanes at Dayton Rubber Co.

Production of polyurethane materials by Dayton Rubber Co., Dayton, O., will be at the 10-million-pound level at the end of 1955, A. L. Freedlander, president of the firm, told a luncheon-meeting of the New York Society of Security Analysts, February 28. The figure represents five times the company's present output.

Mr. Freedlander demonstrated the quick reactivity of the polyurethane ingredients—isocyanates, polyester resins, and activator.

The polyurethane materials are currently being produced at the firm's subsidiary, American Latex Products Corp., Hawthorne, Calif., under patents issued by Monsanto Chemical Co., E. I. du Pont de Nemours & Co., Inc., and Lockheed Aircraft Corp.

The material can be made in a wide range of weights, densities, and rigidities, Mr. Freedlander said, and in its porous form is superior to foam rubber by its lighter weight and longer life. It does not, however, have a compression comeback so fast as foam rubber and will not replace it as a material for foam cushioning, except where weight saving is essential, as in aircraft. Polyurethane is also more expensive to produce, but increased volume and more efficient manufacturing techniques may eventually narrow the gap.

Kleinert Opens Ad Campaign

A breakfast, fashion show, and merchandising symposium, sponsored by I. B. Kleinert Rubber Co., New York, N. Y., rubber goods manufacturer, was held at the Hotel Astor, New York, N. Y., February 8. The firm's advertising program for the Spring of 1955, intended to reach more than 130 million readers, was announced. Richard M. Bleier, Kleinert's vice president in charge of sales, emphasized that the American teen-age-girl market in notions has yet to be competently tapped.

Enjay Sets Price of 23¢ for Butyl Rubber

In a letter to rubber industry companies on February 2, Enjay Co., Inc., stated that based on the expectation of the sale of the government Butyl rubber plants to its affiliates, Esso Standard Oil Co. and Humble Oil & Refining Co., it is now making plans for marketing present grades of Butyl rubber at a price of 23¢ a pound, f.o.b. the plants, in carload lots. Enjay Butyl will be offered initially on the basis of prices firm for a calendar quarter on orders placed in advance of each quarter.

Enjay added that it intended to acquire the government's inventory at the time the plants are transferred so as to be in a position to continue without interruption shipment of the same grades of Butyl to rubber consumers.

Technical service will be provided by the Enjay Laboratories at Linden, N. J.

James A. Walsh, Jr.

F. E. Buddenhagen

C. E. Rueckert

Armstrong Rubber Elects Three New Veeps

Three new vice presidents were elected at the annual meeting of the board of directors of Armstrong Rubber Co., West Haven, Conn. They were Frederick E. Buddenhagen, member of the firm's research and development staff; James A. Walsh, Jr., factory manager; and Charles E. Rueckert, general manager of Armstrong-Norwalk Corp., Norwalk, Conn.

Reelected to chairman of the directorate was James A. Walsh. Others reelected were Frederick Machlin, president; Charles K. Novotny, vice president, production; Eugene A. Roberts, vice president, research and development; Frank L. Dwyer, vice president, secretary and treasurer; John H. Fielding, vice president; Paul L. Giblin, vice president, sales; William E. Shea, assistant treasurer; and S. Aloysius Hardesty, assistant secretary.

Reelected as members of the board were James A. Walsh, chairman; Frederick Machlin, Ernest O. Machlin, Mr. Dwyer, Albert H. Barclay, Jr., Mr. Walsh, Jr., and Mr. Rueckert.

Says Lower Wabash Valley Ideal for Rubber Industry

The Lower Wabash River Valley in southwestern Indiana and southeastern Illinois is a highly favorable area for the successful establishment of rubber products industries, according to a 460-page report of a study made of the area's industrial potentialities by the Chicago & Eastern Illinois Railroad.

Written by Arthur Longini, chief economist for the railroad, and released by C. M. Roddewig, president of the line, the report points out that no tire plants exist in the area, while average wages paid there in 1947 were more than 45% lower than those paid at Akron, O., the nation's tire-producing center.

Other favorable factors cited were the relatively low costs of shipping crude rubber into the area by barge, and the Valley's superiority as a hub for distributing manufactured products to points of consumption and of automobile production. The need of decentralizing Akron's industries in case of war was also listed.

The study analyzes the transportation, mineral resources, housing, public utilities, market and external supply sources, population and labor force, forests, and agriculture of the area. Attention is particularly focused on the cities of Evansville, Mount Vernon, Princeton, Vincennes, Sullivan, Terre Haute, Brazil, Indiana, the country of Vermillion, and the communities of Clinton, Hillsdale, Montezuma, Newport, Cayuga, and Perryville.

General to Issue New Preferred Stock

The General Tire & Rubber Co., Akron, O., has filed a registration statement with the Securities & Exchange Commission for the issuance of an additional 100,000 shares of cumulative preference stock, $100 par value, which will be convertible into common stock. Dividend rate and conversion terms will be determined later.

President William O'Neil stated that the net proceeds from the sale of this stock will be added to the general funds of the company and will be used primarily for working capital.

General Tire also will retire the outstanding 2,771 shares of 3¾% Second Preferred and thus eliminate this entire class of preferred stock.

Witco Acquires Emulsol

Witco Chemical Co., New York, N. Y., has purchased the chemical division of Emulsol Corp., Chicago, Ill., and has organized it into Emulsol Chemical Corp. to continue production of its chemical line. Benjamin R. Harris will continue as president of Emulsol, and Solomon Epstein will remain as executive vice president. No changes in company personnel or policy are anticipated.

Witco, in its thirty-fifth year, operates 12 wholly owned or associated plants and 10 sales offices in the United States, as well as one plant and two sales offices in England. These facilities will become available to Emulsol to enable it to expand its activities in this country and abroad.

New Firestone Division

A sixth sales division, the Midwest division, has been organized by The Firestone Tire & Rubber Co., Akron, O., with headquarters in its new warehouse and office building, 2706-40 W. 79th St., Chicago, Ill. The area covered by the new division includes Chicago, Milwaukee, Peoria, St. Louis, and Grand Rapids.

P. B. Sewel, formerly the firm's central division manager, has been named manager of the Midwest division, and P. C. Dykstra, formerly district manager at Indianapolis, has been appointed assistant manager. R. C. Brown moves up to the position of Indianapolis district manager, and A. G. Anderson becomes operating manager for the Midwest division.

American Resinous Remodels Peabody Plant

American Resinous Chemicals Corp., Peabody, Mass., has completed an extensive remodeling of its laboratories, including the installation of major work areas for resin and plastic emulsions, solution and hot melts; a constant temperature room; space for solvent adhesives and coatings containing pilot-plant processing and churning equipment, and sample and conference rooms.

Special testing equipment has been made available for testing aging, oxidation, and sunlight as required for coatings of fabric and paper, as well as equipment for tensile and shear tests on adhesives of both emulsion and solution types.

Timken Modernizing Steel Mill

The Timken Roller Bearing Co., Canton, O., has undertaken a $360,000 steel mill expansion program to meet the increased demand for heavy-walled, long-length tubing, according to John Fick, vice president in charge of the firm's steel division.

The Gambrinus piercing mill will be lengthened to pierce tubing from 50 to 130% longer than lengths presently processed, and the mill's equipment will be modernized and enlarged. Work on the modernization program is already under way and is expected to be completed in late summer.

Mr. Fick cited the demand for longer, heavier-walled tubing from the oil and gas industry and from the nation's steam power installations as being the motivating force for the company's latest capital expenditure. The step was taken to assure Timken's leadership in the high-quality alloy steel industry, he said.

Oil Affiliate Has New Name

Standard Oil Development Co., New York, N. Y., petroleum research and engineering affiliate of the Standard Oil Co. of New Jersey, has changed its name to Esso Research & Engineering Co. The new name is intended to provide better identification and to describe more accurately its expanded activities, the company says. One of the firm's major facilities is the Esso Research Center, Linden, N. J.

New Use for Versicon Hose

Versicon hose has been incorporated into the hydraulic control system design of the 88-H power grader manufactured by Austin-Western Co., Aurora, Ill., according to Thermoid Co., Trenton, N. J., maker of the hose. Reinforced with rayon braid, the Versicon hose was found to be advantageous over the wire-braided hose formerly used.

In the return lines between the hydraulic pump and the fluid reservoir, pressures are lower, and the non-wired Versicon proved adequate for the purpose, the company says. Its ready availability as a stock item also made this hose desirable.

Composed of three layers of neoprene compound interspersed with two layers of rayon braid, the hose is oil and grease resistant and permits working pressures up to 250 psi., four times the operating pressure in the return lines.

Curtiss-Wright Exhibits

An exhibition of some of its new industrial and scientific equipment was held by Curtiss-Wright Corp., Wood-Ridge N. J., at the Hotel Biltmore, New York, N. Y., February 3-6. Among the items on display were ultrasonic generators for quality control and inspection, closed circuit industrial television, industrial black light, electronic colorimeters, a variety of nuclear equipment, induction heating units, and high-temperature foamed and laminated plastic products.

Hycar in Dairy Appliances

Molded Hycar American rubber parts are being used in the design of farm and dairy appliances manufactured by De Laval Separator Co., Poughkeepsie, N. Y., according to B. F. Goodrich Chemical Co., Cleveland, O., producer of Hycar. Highly resistant to the deteriorating influence of butterfat, the synthetic rubber was found to increase the useful life of such parts as check valves, cream seals, inlet and outlet valves, and vacuum control caps by as much as three times.

Resistance of Hycar to hot detergents also proved valuable since milkers and separators are cleansed twice a day in normal operating use, Goodrich says. De Laval has incorporated these parts in its complete line of milkers, separators, water heaters, milk coolers, and food freezers.

Goodrich Granted Two More Tubeless Tire Patents

Two more U. S. patents covering basic features of tubeless tires have been granted The B. F. Goodrich Co., Akron, O. Its seventh and eighth, the former patent is for an inner liner which retains its characteristics at high temperatures; the latter patent is for a fabric-Butyl rubber combination which can be used as the air-retaining liner for tubeless tires.

The company has offered to license tire manufacturers under these and its other patents and to make available its technical knowledge in the production and sale of tubeless tires. About 75% of the firm's passenger-car tire production capacity is now devoted to the tubeless.

Merck Praises Fluorocarbon Plastics

Fluorocarbon plastics, a laboratory curiosity little more than ten years ago, have now come of age, according to Walter J. Merck, sales manager of the chemical manufacturing division of M. W. Kellogg Co., Jersey City, N. J., producer of Kel-F polymers.

Among the new fields opened up recently to these materials, he listed dispersion coatings for metals or non-metals, tear and chemical resistant thin films, glass cloth laminates, chemically resistant rubber compounds and elastomers, and oils, waxes, and greases of high thermal stability.

As an example of the continuing growth of demand for fluorocarbon plastics, he said that a Kel-F Elastomer pilot-plant would be put into operation early this year. Valuable properties cited for this material include resistance to powerful oxidants, thermal stability up to 400° F., resistance to oils at high temperatures, and extremely low moisture absorption.

114-Foot Rubber Sidewalk at Houston Stock Show

A moving rubber sidewalk, capable of handling 15,000 people an hour and featuring what is said to be the widest conveyor belt ever used commercially to transport humans, is in operation at the twenty-third annual Houston Fat Stock Show and Rodeo, Houston, Tex., according to The B. F. Goodrich Co., Akron, O., manufacturer of the conveyor's belt.

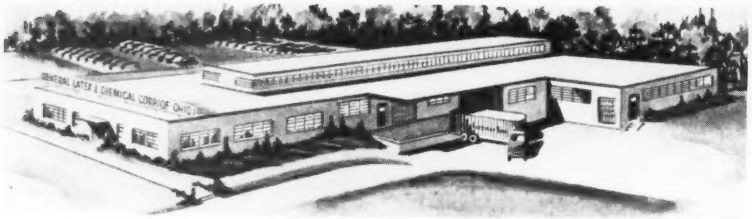
The belt extends along a 114-foot course, measures 230 feet in continuous length, has an 82-inch width, and is ⅞-inch thick with seven plies of fabric for interior reinforcement. Goodrich says that this belt is made with a specially compounded rubber cover that provides a scuff-resistant, easy-to-clean surface.

The sidewalk, laid down on a pedestrian bridge 50 feet above Buffalo Bayou, links a large parking area with the Coliseum's exposition hall and auditorium. The sidewalk travels 132 feet a minute, rises 12 feet at the exposition hall end, and is expected to transport more than a million people a year.

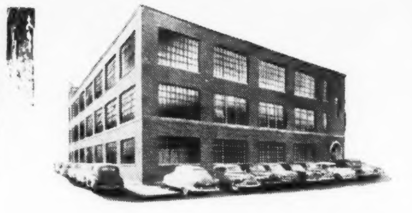
Resembling an escalator in construction, the sidewalk has three-foot high sidewalls and moving handrails synchronized with the speed of the belt. It is powered by an electric motor which turns a drive pulley at the upper end of the walk. The belt moves on closely spaced steel rollers.

General architect for the project was Goleman & Rolfe, Houston. Link-Belt Co., Houston and Chicago, Ill., manufactured the rollers and bearings, fabricated the steel structure, and supplied power equipment. Otis Elevator Co., New York, N. Y., furnished the moving handrail equipment. Contractor was Fisher Construction Co.

Members of the Houston Fat Stock Show's executive committee completing the inaugural ride on the 114-foot moving rubber sidewalk. Roy Hofheinz, Mayor of Houston, is stepping off the belt at left



Architect's Drawing of General Latex's New Plant in Ashland, O.



New Chicago Plant of Atlas Electric Devices

New General Latex Plant at Ashland, O.

A new $300,000 plant at Ashland, O., has been built by General Latex & Chemical Corp., Cambridge, Mass. Occupying 30,000 feet of floor space, the facilities include a development and quality-control laboratory and bulk storage equipment for natural, synthetic, and prevulcanized latices. It will round out the present expansion plans in this twenty-fifth anniversary year of the company.

Import shipments of natural rubber latex will continue to be handled through the firm's pier-side installations at Boston and Baltimore and conveyed to Ashland by rail. Materials compounded at the new plant will be shipped to their destinations by truck.

Giant Conveyor Belt Still Flawless; Installed in '48

A 3,300-foot rubber conveyor belt, reinforced internally with spliced steel cables, which was installed in 1948 in a Hibbing, Minn., mine has never suffered a splice repair or replacement, according to B. F. Goodrich Co. Industrial Products Division, Akron, O., maker of the belt.

Operating at 30,000 pounds' tension and traveling 590 feet a minute, the conveyor moves 1,000 tons of iron ore an hour up an incline 350 feet above the open Mesabi range pit. More than 8,000,000 tons of ore have been hauled during the seven-year period.

The belt is subjected annually to a complete X-ray checkup to probe for possible failure of the embedded steel cables. It is reported to show no signs of breakdown, and many more years of use are predicted for it. The Hibbing mine belt is the precursor of the many similar pieces of equipment now being used elsewhere for heavy-service operations, according to the Goodrich company.

McDermott Joins Firm of Designers

Bernard A. McDermott has joined Smith & Scherr, Designers, Akron, O., as a full partner; the name of the firm now becomes Smith, Scherr & McDermott, Designers. For the past 14 years director of art and product design at Sun Rubber Co., Barberton, O., and also assistant to the company's president, Mr. McDermott was formerly an instructor at the Cleveland Institute of Art and a free-lance designer of various products such as children's wheel goods, ceramic ware, furniture, and appliances.

The company has also announced that it has organized Vyn-L-Mold & Development Corp., Akron, both companies to work collaboratively on all redesign or new product developments from the idea stage through design, packaging, mock-ups, and sample runs.

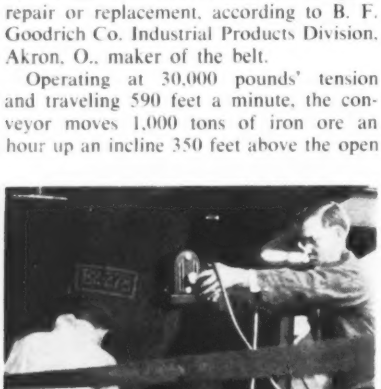
Testing Equipment Manufacturer Moves

Atlas Electric Devices Co. has moved into its new plant at 4114 N. Ravenswood Ave., Chicago 13, Ill. The building will house the company's expanded research and manufacturing facilities. Atlas produces Fade-Ometers, Weather-Ometers, Launder-Ometers, Scorch Testers, and Accelerators.

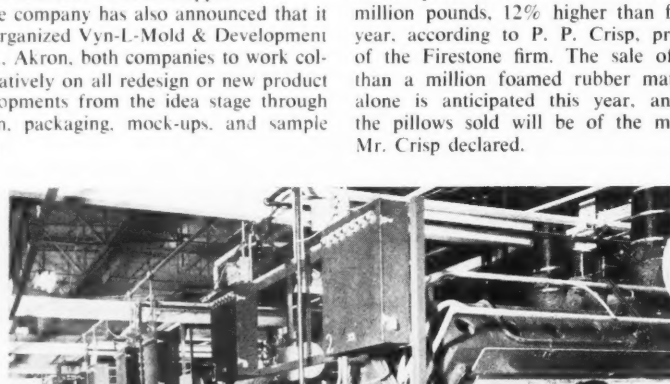
Firestone Products Adds Foamex Presses

Firestone Industrial Products Co. has increased by one-third its production capacity of Foamex foam rubber pillows and furniture cushions by the installation of 30 new presses at its Fall River, Mass., factory. Together with other equipment, the automatic cycle presses cost more than $900,000 and are expected to have a production turnout of 275,000 pounds of foamed rubber products a month.

Industry-wide production of foamed rubber products in 1955 will exceed 205 million pounds, 12% higher than for last year, according to P. P. Crisp, president of the Firestone firm. The sale of more than a million foamed rubber mattresses alone is anticipated this year, and half the pillows sold will be of the material, Mr. Crisp declared.



Technician X-Raying Goodrich conveyor for possible failure of steel cable splicing



Workman stripping foamed rubber seating cushion from the mold of one of Firestone Industrial Products Co.'s new presses

The $5 Billion Brain Boys

The Giffels & Vallet, Inc., L. Rossetti firm of engineering consultants, who have designed a considerable number of plants and installations for the rubber and related industries, was featured in an article in the *Saturday Evening Post* for February 5. The article, entitled "The Boys with the $5,000,000,000 Brains," was written by Arthur W. Baum and reviewed the origin and growth of an organization that is determined to handle anything that comes up without going outside its own organization; that will design anything, but will build nothing.

GVR, as the firm is called, has already designed about $5 billion worth of plants, including atomic energy facilities, but is constantly trying to lessen the percentage of industrial jobs in order to undertake such projects as the two main buildings of Detroit's new Civic Center. GVR would like to have at least one job out of every ten in the form of a school, church, hospital, or other public building.

GVR will work by the hour, but is also ready to take a client who merely describes what he wants to make and how much he can spend on a factory to make it. The company then selects the site, lays out the process, designs the building, hires and supervises the contractor, tends to permits and documents, inspects the final result, and then hands the keys to the client.

One thing the firm will not design, however, is residences. The average home is a hotel, restaurant, factory, utility plant, and clubhouse all in one miniature package with a price limit on it and is too tough a problem.

1955 Polymer Corp. Budget $6 Million

Polymer Corp., Ltd., has submitted to the Canadian Minister of Defense Production a capital budget for the year 1955 of $5,930,000 for new items, according to President J. D. Barrington of this government-owned synthetic rubber facility. In addition, there is a carryover of $2,800,000 for projects started in 1954. As in all previous years, these expenditures will be financed out of company earnings.

The largest item is $3,000,000, which amount will enable Polymer to increase production to meet expanding markets. Considerable capital continues to be required to keep the plant technically modern in a highly competitive world market. A program is also under way to improve efficiency and employe working conditions. Additions to technical service laboratories are included in the proposed expenditures.

Mr. Barrington stated that 1955 promises to be a very active year for Polymer Corp. and one which may see some increase in pace in order to take advantage of changing market conditions.

Foster D. Snell, Inc., New York, N. Y., has purchased Crippen & Erlich Laboratories, Inc., Baltimore, Md.

Koppers, Firestone to Build Brazilian Styrene Plant

A styrene monomer plant at Cubatao, Brazil, with an estimated annual production capacity of 10 million pounds will be built and operated by the newly formed Companhia Braziliera de Estireno, jointly organized by Koppers Co., Inc., Pittsburgh, Pa., The Firestone Tire & Rubber Co., Akron, O., and certain Brazilian interests.

The plant will be essentially under American ownership, since contracts provide for slightly more than 50% control by both Koppers and Firestone. In addition, one of the Brazilian firms involved in the proprietorship is Companhia Braziliera de Plastico (Koppers), a polystyrene manufacturer in which Koppers has had an interest since 1950.

The new company has been granted a loan of $2,500,000 by the Export-Import Bank to apply on U. S. dollar costs in the construction of the plant. The remainder of the financing will be effected by sale of stock to the partners.

The major proportion of the plant's production will go to Brazilian producers of polystyrene items. The rest will go into the making of styrene latices and high styrene polymers for the manufacture of shoe soles and other goods.

To be situated adjacent to a government owned refinery, the plant will be designed by Koppers engineering and construction division, erected by Brazilian contractors, and operated under a management contract with Koppers chemical division, which will furnish key personnel. Most of the personnel will be Brazilian, with total employes numbering about 125. Virtually all of the machinery for the plant will be American made.

NEWS ABOUT PEOPLE

C. E. Lyon, vice president and general manager of the chlorinated products division of Diamond Alkali Co., Cleveland, O., will retire May 1 and will be succeeded as general manager by **Loren P. Scoville,** now director of engineering. **C. C. Brumbaugh,** director of research, will become director of engineering.

James M. Robbins has been named division production manager of tires, inner tubes, and associated products for the B. F. Goodrich Co. Tire & Equipment Division, Akron, O. He has been associated with the company since 1928, having served in the United States, Sweden, South America, and Canada.

C. W. Grady has been named West Coast regional sales manager of Dunlop Tire & Rubber Corp., Buffalo, N. Y.

E. G. Balzano has been named chief engineer of Productos de Caucho Villegas, S.A., Bogota, Colombia, South American affiliate of Seiberling Rubber Co., Akron, O. His former position as plant engineer at Akron will be assumed by **Maxwell Cole,** previously chief power engineer with the firm.

A. B. Steele has been appointed manager, and **C. P. McClelland** has been named assistant manager of technical service for Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y.

Quentin F. Ebert has been appointed director of purchases for Columbia-Southern Chemical Corp., Pittsburgh, Pa., and **J. Earl Burrell** has been named assistant works manager at the firm's Natrium, W. Va., plant.

Alyn M. BeDell has been appointed technical director of Dismuke Tire & Rubber Co., Inc., Clarksdale, Miss. He will be in charge of all research and development plus production.

R. P. Ganchan has been promoted to vice president and general manager of Automotive Rubber Co., Inc., Detroit, Mich., and will direct the operations of the firm's plants in Detroit, Kalamazoo, Houston, and Savannah. Also advanced was **R. H. Glezen,** now vice president and general sales manager of the rubber tank lining, rubber insulated mechanical parts, closed-cell sponge rubber, and molded closed-cell polystyrene manufactures.

M. W. Reynolds has been appointed general manager of Acheson Colloids Co., and **P. C. Buck** has been named head of engineering and production for Acheson Industries, Inc. The two associated firms are in Port Huron, Mich., with Acheson Industries, Inc., being the parent company.

Robert E. Barnum has joined the chemical division of The Goodyear Tire & Rubber Co., Akron, O., as field sales representative in the southeastern district.

Jerome L. Frankel has been named manager of the Palo Alto, Calif., plant of Advance Solvents & Chemical Corp., New York, N. Y. He was recently named secretary-treasurer of Metalead Products Corp., Palo Alto, which was purchased by Advance Solvents last month. **Eugene Dondero** has replaced Mr. Frankel as traffic manager in the Jersey City, N. J., headquarters.

W. H. Parkinson has been named advertising, publicity, and sales promotion manager of Quaker Rubber Corp., Philadelphia, Pa.

William F. Welch and **Richard E. Benton** have joined the chemical products and materials development division of The Goodyear Tire & Rubber Co., Akron, O.

Carl F. Unger has been appointed manager of municipal fire hose sales for Hewitt-Robins, Inc., Buffalo, N. Y.

Alden C. Brett, treasurer of Hood Rubber Co., division of The B. F. Goodrich Co., Watertown, Mass., has been renamed chairman of the Advisory Panel on Cost Justification of the Controllers Institute of America.

Tracy Cowen has been appointed assistant general manager of Standard Insulation Co., East Rutherford, N. J., and **Alex Sacher** has been named technical director.

Gerard B. Meynell has been named advertising manager of the organic chemicals and pigments divisions of American Cyanamid Co., New York, N. Y.

H. E. Minnerly has been named Hycar and rubber chemicals sales representative in the Chicago area for B. F. Goodrich Chemical Co., Cleveland, O., and **G. S. Ramsey** has become sales representative in the northern New York area.

A. J. Lamond has been appointed manager of packing sales for Quaker Rubber Corp., division of H. K. Porter Co., Inc., Philadelphia, Pa.

George J. Bonness has retired as a field engineer for Hewitt-Robins, Inc., Stamford, Conn., after more than 30 years of service with the company.

Francis A. Dunnington has been appointed chief engineer for the firm's Restfoam Division, Buffalo, N. Y.

H. A. Bellows, vice president in charge of replacement tire sales of The General Tire & Rubber Co., Akron, O., has been assigned to new duties, and **L. L. Higbee,** Los Angeles division sales manager, has been promoted to trade sales manager, with headquarters in Akron.

Philip N. Felleman

Philip N. Felleman, a 25-year veteran of the rubber and plastics industries, has joined George Woloch Co., Inc., New York, N. Y., in an executive capacity. Mr. Felleman was formerly co-owner of McCormick Rubber Co., vice president of Meyer & Brown Corp., and sales manager of the plastics division of H. Muehlstein & Co.

Paul E. Nelson has been appointed Midwest regional sales manager of Dunlop Tire & Rubber Corp., Buffalo, N. Y., and will supervise operations in the Chicago, Kansas City, and Dallas areas.

Hugh Allen, associated with the public relations staff of Goodyear Tire & Rubber Co., Akron, O., for 35 years, has retired. He is the author of "The House of Goodyear," "Rubber's Home Town," and "The Story of the Airship," and is an authority on the history and development of lighter-than-air aviation, having served as American representative of the *Graf Zeppelin's* early flights in this country.

Carl S. Marvel, research professor of organic chemistry at the University of Illinois, Urbana, Ill., whose investigations aided the United States production of synthetic rubber and anti-malarials, will receive the 1955 Gold Medal of The American Institute of Chemists at the thirty-second annual meeting of the organization to be held in Chicago, May 11-13.

David H. Simonds has been appointed director of advertising of Bolta Products Division of The General Tire & Rubber Co., Lawrence, Mass.

Charles R. Fay, comptroller for Pittsburgh Plate Glass Co., Pittsburgh, Pa., since 1944, has been elected vice president and comptroller of the firm.

Earl V. Clark, formerly with New Jersey Rubber Co. and Avon Sole Co., has joined Dewey & Almy Chemical Co., Cambridge, Mass., as rubber chemist.

Collier W. Baird, Jr., has been promoted from secretary to vice president of Baird Rubber & Trading Co., Inc., New York, N. Y., and **Helen L. Danton** has assumed the post of secretary.

R. V. Falconiero, chief accountant of Lee Rubber & Tire Corp., Conshohocken, Pa., has been elected assistant treasurer. He joined the company in 1931 and advanced through the cost, accounting, and tax departments.

James O. King has been promoted to the position of special staff assistant in the sales department of Diamond Alkali Co., Cleveland, O.

Marvin M. Kahn has been promoted to director of development for new products for Acme-Hamilton Mfg. Corp., Trenton, N. J.

J. Terry Taylor has been named technical manager of fuel cell design and engineering for the aeronautical products department of B. F. Goodrich Co. Tire & Equipment Division, Akron, O. He has been associated with Goodrich for 15 years.

Warren B. Stanton has been named assistant to the manager of the new products-organic chemicals department of Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Mich.

L. A. Bedford has been named manager of quality control in the chemical operations department of The Goodyear Tire & Rubber Co., Akron, O. Replacing him as section head in the chemical materials development department is **F. C. Betzhold.**

Gordon R. Porterfield has been named district representative of the New York area for Elmes Engineering Division of American Steel Foundries, Cincinnati, O.

E. W. Volkmann has been appointed manager of the research department of Koppers Co., Inc., Pittsburgh, Pa., and **A. R. Powell** has been named special research adviser to the department.

John Repar has been promoted to sales engineer for the rubber products division of The Parker Appliance Co., Cleveland, O., and will cover the West Coast area from the firm's Los Angeles office.

G. F. A. Stutz has been appointed manager of the pigment division of New Jersey Zinc Sales Co., New York, N. Y., succeeding **F. W. Jones,** who has become assistant to the vice president.

L. C. Holloman, Jr., has been apopinted manager of the central sales region of Hewitt-Robins, Inc., Stamford, Conn.

Hansen-Cambridge

Frederick H. Mason

Oliver M. Hayden

William F. Flower

Frederick H. Mason has been named general manager of General Latex & Chemical Corp. (of Ohio), Ashland, O., and **Robert L. Kelly** has been appointed control chemist. Also named was **Joseph F. Moroney,** who becomes factory superintendent of the newly opened plant.

Bob Plank, formerly with Ace Rubber Co., has joined the technical staff of Fargo Rubber Co., Los Angeles, Calif.

Robert L. Hutchison, formerly general manager of operations, and Joseph A. Neubauer, formerly technical director, have been elected vice presidents and directors of Columbia-Southern Chemical Corp., Pittsburgh, Pa. Mr. Hutchison, with the firm since 1925, will be in charge of operations. Mr. Neubauer, associated with the company since 1933, will be in charge of research and development.

Ernest K. Hunt has been promoted to public relations manager for American Cyanamid Co., New York, N. Y.

Gilbert K. Trimble, president of Midwest Rubber Reclaiming Co., was reelected president of the Rubber Reclaimers Association, Inc. Also reelected were **Irving Laurie,** general manager of Laurie Rubber Reclaiming Co., as vice president, and **Charles T. Jansen,** advertising manager of *Rubber Age*, as secretary-treasurer. **F. E. Traflet,** vice president of Pequanoc Rubber Co., was appointed chairman of the Association's executive committee.

Carl T. Zinsmeister, associated with United Engineering & Foundry Co., Pittsburgh, Pa., for 43 years, and now secretary of the firm, has been elected to serve on its board of directors. He is also assistant secretary and a director of Stedman Foundry & Machine Co., Inc., a wholly owned subsidiary of United Engineering, and is a member of the advisory board of the Dormont Branch of Peoples First National Bank & Trust Co.

H. Herman Abernathy

Oliver M. Hayden has been named assistant director of sales for the rubber chemicals division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and has been succeeded as manager of the division's technical section by **H. Herman Abernathy,** formerly assistant technical sales manager. Also promoted in the division are **Robert F. Harwick,** now assistant manager of the Akron, O., district sales office; **Ralph B. Appleby,** now special assistant to the manager and assistant manager of the Akron district; and **Roger N. Conklin,** now technical sales representative in the Wilmington district sales office.

Robert B. Wilson has been appointed sales engineer for New England and parts of New York and New Jersey for Minnesota Rubber & Gasket Co., Minneapolis, Minn.

Harold A. Polonus has joined Ketchum, MacLeod & Grove, Inc., Pittsburgh, Pa., as public relations account executive. He formerly was in the public relations departments of Seiberling Rubber Co. and Goodyear Tire & Rubber Co.

William F. Flower has been appointed sales manager of the new foam rubber products division of Collins & Aikman Corp., Roxboro, N. C. His duties will include the organizing and directing of a nation-wide sales force of jobbers, manufacturing agents and representatives, and the supervising of an experimental program to develop new uses and markets for the company's foam rubber-backed fabrics. For the past five years Mr. Flower worked in the Chicago area in sales and distribution for The Goodyear Tire & Rubber Co. and The B. F. Goodrich Co.

Kenneth R. Brown, vice president of Atlas Powder Co., Wilmington, Del., has been awarded the 1955 honor award of the Commercial Chemical Development Association to be presented at a dinner at the Hotel Statler, New York, N. Y., March 17. The award, presented annually for outstanding achievement in the field of commercial chemical development, was given to Mr. Brown for his pioneering work in the development and marketing of sorbitol and related products.

Sol Sackel, director of advertising and merchandising for Bolta Products Division of The General Tire & Rubber Co., Lawrence, Mass., has resigned and will form his own advertising agency, Sackel Co., Inc., Boston, Mass. David H. Simonds, formerly product advertising manager for the Bolta firm, will succeed Mr. Sackel.

N. R. Kuloor, on leave of absence from the Shri Ram Institute for Industrial Research in his native India, has joined Foster D. Snell, Inc., New York, N. Y., for a four-month training period in American chemical engineering. Dr. Kuloor is the recipient of an industrial training grant under the Point IV program of technical cooperation with other countries and has come to the United States under the auspices of the Foreign Operations Administration and the United States Department of Labor's Bureau of Apprenticeship. He is a graduate of St. Xavier's College, Bombay, and has D.I.C. and Ph.D. degrees from Imperial College, London University.

OBITUARIES

Guy O. Hunter

Guy O. Hunter, director of sales for Turner Halsey Co., New York, N. Y., and for 47 years associated with the textile industry, died February 11 at High Point, N. C., while on a business trip. He was 67 years old.

He was also a director of Echota Cotton Mills, Calhoun, Ga., and executive vice president and director of The Mary Leila Cotton Mills, Inc., Greensboro, Ga.

Mr. Hunter was graduated from Virginia Military Institute and the Philadelphia Textile School.

In 1908 he joined Hunter Mfg. & Commission Co. and rose to the presidency in 1926, remaining with the firm until 1932. Two years later he joined Turner Halsey Co. During World War I, he served with the War Department in an advisory capacity on textile procurement.

He was a member of the joint executive committee of United Hospital, Port Chester, N. Y., and belonged to the Merchants, Arkwright, Apawamis, and Shenorock Shore clubs and Special Car Associates.

Funeral services were held at his Rye, N. Y., home, February 14.

Mr. Hunter is survived by three brothers and three daughters.

Gordon A. McLean

Gordon Alexander McLean, an authority on the Banbury mixer, died January 28 in Fort Lauderdale, Fla., after an illness of several months.

He was born in Canada on November 7, 1907. He later became a naturalized citizen of this country.

In 1933 he organized Interstate Welding Service, Chicago, Ill., which specialized in the repairing and rebuilding of Banburys. The firm was moved to Akron, O., in 1939, and last year was absorbed into Skinner Engine Co., Erie, Pa., becoming its rubber machinery division.

Funeral services, followed by cremation, were held on February 2 in Akron.

Mr. McLean is survived by his wife, a brother, and a sister.

Henry Hardenbergh

Henry Hardenbergh, chairman of the board of directors of New Jersey Zinc Co., New York, N. Y., died February 9 at New Rochelle Hospital, New Rochelle, N. Y. He was 72.

A resident of Bronxville, N. Y., he was born in New York, N. Y. He was graduated from Harvard University in 1904 and joined New Jersey Zinc Co. as a chemist the following year. Advancing through the organization, he was elected president and director of the firm in 1943 and became its chairman of the board in 1951.

Mr. Hardenbergh held memberships in the Harvard Club, the University Club, the American Institute of Mechanical Engineers, the American Mining Congress, the American Zinc Institute, Newcomen Society, Blind Brook Club, St. Andrew's Golf Club, Blue Ridge Country Club, and the Down Town Association.

Funeral services were held at Reformed Church, Bronxville, and burial took place at the Kensico Cemetery, Valhalla, N. Y., on February 11.

Surviving Mr. Hardenbergh are two daughters, a sister, a brother, and four grandchildren.

John Westendorf

John Westendorf, president of The Premier Rubber Mfg. Co. and secretary-treasurer of Dayton Casting Co., both in Dayton, O., died January 4 from a cerebral hemorrhage.

He was born in Dayton on August 11, 1876, and attended Holy Trinity School. With his brothers, Joseph and Clarence, he organized the Dayton Casting Co. in 1909. In 1922, with Joseph, he purchased controlling interest of Premier Rubber.

At his death, Mr. Westendorf held directorships in the Third National Bank, the Home Savings & Loan Association, and the Dayton Automobile Club. Formerly he had been treasurer of the Home Savings & Loan Association, vice chairman of the Dayton Metropolitan Housing Authority, and president of the Dayton Bicycle Club.

He was a member of the Knights of Columbus, the Eagles, the Elks, and the Chamber of Commerce and had been active in many fund campaigns and charitable works.

He is survived by his wife and several nieces and nephews.

Paul R. McCampbell

Paul R. McCampbell, vice president and a director of I. B. Kleinert Rubber Co., and associated with the firm's plant at College Point, L. I., for 30 years, died February 2 at his Great Neck, L. I., home after a long illness.

He was born in Crawfordsville, Ind., in 1896 and was graduated from Wabash College. During World War I he served as captain with the 104th Infantry, 26th Division, participating in all of the unit's major battles in France and winning several citations.

After his demobilization, the deceased was with United States Rubber Co. and Hunter Dry Kiln Co. before joining Kleinert as assistant chemist in 1925.

Mr. McCampbell was active in Great Neck civic affairs and once served as Mayor of Russell Gardens, an incorporated village of Great Neck.

He leaves a wife, a son, and two sisters.

Services were held at Community Church, Great Neck, on February 5.

FINANCIAL

Aetna-Standard Engineering Co., Akron, O. Second half, 1954: net profit, $410,818, equal to $1.02 each on 402,722 shares outstanding, compared with $671,439, or $1.75 each on 384,546 shares, in the 1953 half; sales, $9,730,000, against $14,200,000.

Allied Chemical & Dye Corp., New York, N. Y. For 1954: net earnings, $43,071,766 equal to $4.80 each on 8,981,167 capital shares, compared with $45,171,647, or $5.10 each on 8,856,396 shares, in 1953; sales, $530,776,716, against $545,560,906; federal income taxes, $28,314,699, against $37,278,494.

American Cyanamid Co., New York, N. Y. For 1954: consolidated net earnings, $27,050,000, equal to $2.95 each on 8,722,921 common shares, compared with $27,472,000, or $3.15 each on 8,646,261 shares, in 1953; sales, $397,000,000, against $380,000,000.

American Zinc, Lead & Smelting Co., Columbus, O. Year ended December 31, 1954: net profit, $1,811,164, equal to $2.19 a share, compared with $1,626,262, or $1.91 a share, a year earlier.

Carborundum Co., Niagara Falls, N. Y., and U. S. and Canadian subsidiaries. For 1954: net income, $3,283,704, equal to $1.92 each on 1,713,070 common shares, contrasted with $5,721,553, or $3.69 each on 1,549,935 shares, in 1953; sales, $71,898,399, against $82,927,005; income taxes, $2,121,936, against $4,945,429.

Philip Carey Mfg. Co., Cincinnati, O., and subsidiaries. For 1954: net earnings, $2,477,253, equal to $3.00 a common share, against $2,398,508, or $2.90 a share, in 1953.

Glidden Co., Baltimore, Md., and subsidiaries. Quarter ended January 31, 1955: net profit, $1,390,547, equal to 61¢ a common share, against $1,306,141, or 57¢ a share, in the 1954 period.

The Eagle-Picher Co., Cincinnati, O., and domestic subsidiaries. Year ended November 30, 1954: net profit, $2,446,829, equal to $2.47 a share, compared with $3,242,966, or $3.28 a share, in the preceding fiscal year; net sales, $83,233,880, against $85,033,403.

The General Tire & Rubber Co., Akron, O. Year ended November 30, 1954: net profit, $5,879,500, equal to $4.30 a share, contrasted with $7,431,802, or $5.87 a share, in the preceding fiscal year; net sales, $216,986,110 (a record), against $205,371,098.

Crown Cork International, Baltimore, Md., and domestic subsidiary. Twelve months to December 31, 1954: net income, $842,227, equal to $2.17 a share, contrasted with $665,420, or $1.71 a share, in the preceding 12 months.

Goodall-Sanford, Inc., Reading, Mass. Fourth quarter, 1954: net loss, $2,330,000, contrasted with net loss of $711,000 in the third quarter; consolidated sales, $6,665,000, against $6,921,000.

Johns-Manville Corp., New York, N. Y., and consolidated subsidiaries. For 1954: net profit, $16,655,658, equal to $5.24 each on 3,181,530 common shares, constrasted with $19,661,412, or $6.20 each on 3,172,084 shares, in the previous year; net sales, $253,151,584, against $252,642,136; taxes, $17,808,741, against $20,736,098.

Johnson & Johnson, New Brunswick, N. J., and domestic subsidiaries. For 1954: net profit, $9,461,307, equal to $4.45 each on 2,106,434 common shares, compared with $8,907,895, or $4.19 each on 2,100,366 shares, the year before; net sales, $200,925,898, against $197,605,369; income taxes, $10,374,145, against $10,772,691.

Raybestos-Manhattan, Inc., Passaic, N. J., and domestic subsidiaries. Year ended December 31, 1954: net income, $2,798,094, equal to $4.45 a share, contrasted with $3,361,506, or $5.35 a share, a year earlier.

Rome Cable Corp., Rome, N. Y. Nine months ended December 31, 1954: net earnings, $644,000, equal to $1.25 a common share, against $1,259,000, or $2.52 a share, in the 1953 period.

A. G. Spalding & Bros., Inc., Chicopee, Mass. Year ended October 31, 1954: consolidated net earnings, $779,553, equal to $1.47 a share, compared with $677,092, or $1.30 a share, in the preceding fiscal year; sales, $27,192,465, against $26,706,122; taxes, $949,500, against $762,000.

Union Carbide & Carbon Corp., New York, N. Y. For 1954: net income, $89,779,271, equal to $3.10 each on 28,952,794 capital shares, contrasted with $102,783,442, or $3.55 a share, in 1953; sales, $923,693,379, against $1,025,833,041; federal income taxes, $82,349,987, against $124,976,459.

United States Rubber Co., New York, N. Y., and subsidiaries. Year ended December 31, 1954: net earnings, $27,958,902, equal to $4.29 each on 5,302,124 common shares, contrasted with $32,732,300, or $5.19 a share, in 1953; net sales, $781,574,240, against $838,451,068; income taxes, $26,564,147, against $39,883,436; current assets, $355,115,281, current liabilities, $122,667,819, against $359,597,174 and $128,340,940, respectively, at the end of 1953.

NEWS BRIEFS

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has changed the name of its 32-year-old rubber chemicals division to elastomers division, to reflect better the wider scope of the division's activities, which now include "Hypalon" chemical rubber and "Hylene" isocyanates, as well as neoprene and an expanding number of rubber chemicals, as such.

Glyco Products Co., Inc., Brooklyn, N. Y., has moved its executive and sales office to the Empire State Building, New York, N. Y.

Atlas Powder Co., Wilmington, Del., has moved its general offices from the downtown Delaware Trust Bldg., where it occupied space 34 years, to a new building of its own on a 45-acre tract of land about three miles from downtown Wilmington. The grounds also include an employe cafeteria - recreation building, swimming pool, tennis courts, and a baseball diamond.

Borne, Scrymser Co., Elizabeth, N. J., and Charlotte, N. C., has been named an East Coast distributor of Rubarite, synthetic rubber latex-barytes mineral paving material manufactured by Rubarite, Inc., Magnet Cove, Ark., a company owned jointly by The Goodyear Tire & Rubber Co., National Lead Co., and Bird & Son, Inc.

Witco Chemical Co., New York, N. Y., has acquired a half interest in Ultra Chemical Works, Inc., Paterson, N. J., producer of industrial and household detergents, wax emulsions, textile chemicals, and specialized synthetic organic chemicals; Ultra has additional plant facilities at Joliet, Ill., and Hawthorne, Calif.

Mobay Chemical Co., St. Louis, Mo., has licensed Albert Trostel & Sons Co., Inc., Milwaukee, Wis., to manufacture polyurethane rubber materials and polyurethane rigid and flexible foams using Mobay-made isocyanates and polyesters and employing Mobay techniques. A subsidiary of the Trostel organization, Albert Trostel Packings, Ltd., Lake Geneva, Wis., is one of the country's largest producers of hydraulic and pneumatic seals for the automotive, farm implement, and aviation industries.

Alfred Hale Rubber Co., Inc., manufacturer of Rajah brand soling materials, has moved its offices and production facilities from North Quincy, Mass., to Lima, O.

Marbon Chemical Division, Borg-Warner Corp., Gary, Ind., plans to acquire an option on a 300-acre plant site at Washington, W. Va., for the eventual construction of additional manufacturing facilities.

Firestone Tire & Rubber Co., Akron, O., has exceeded the six-million mark in its production of tubeless tires.

Advance Solvents & Chemical Corp., New York, N. Y., has purchased control of Metalead Products Corp., Palo Alto, Calif.; the two firms will not merge.

Wellco-Ro-Search, Waynesville, N. C., has installed direct overseas teletype communications with its foreign affiliated factories to facilitate business operations and to provide direct contact between itinerant members of the firm and their families.

Stoner Rubber Co., Anaheim, Calif., developed the vibration-damping brackets, made of sandwiched steel and Hycar American rubber, product of B. F. Goodrich Chemical Co., Cleveland, O., now used to support cabin pressurizing superchargers in Douglas's DC-6's and DC-7's.

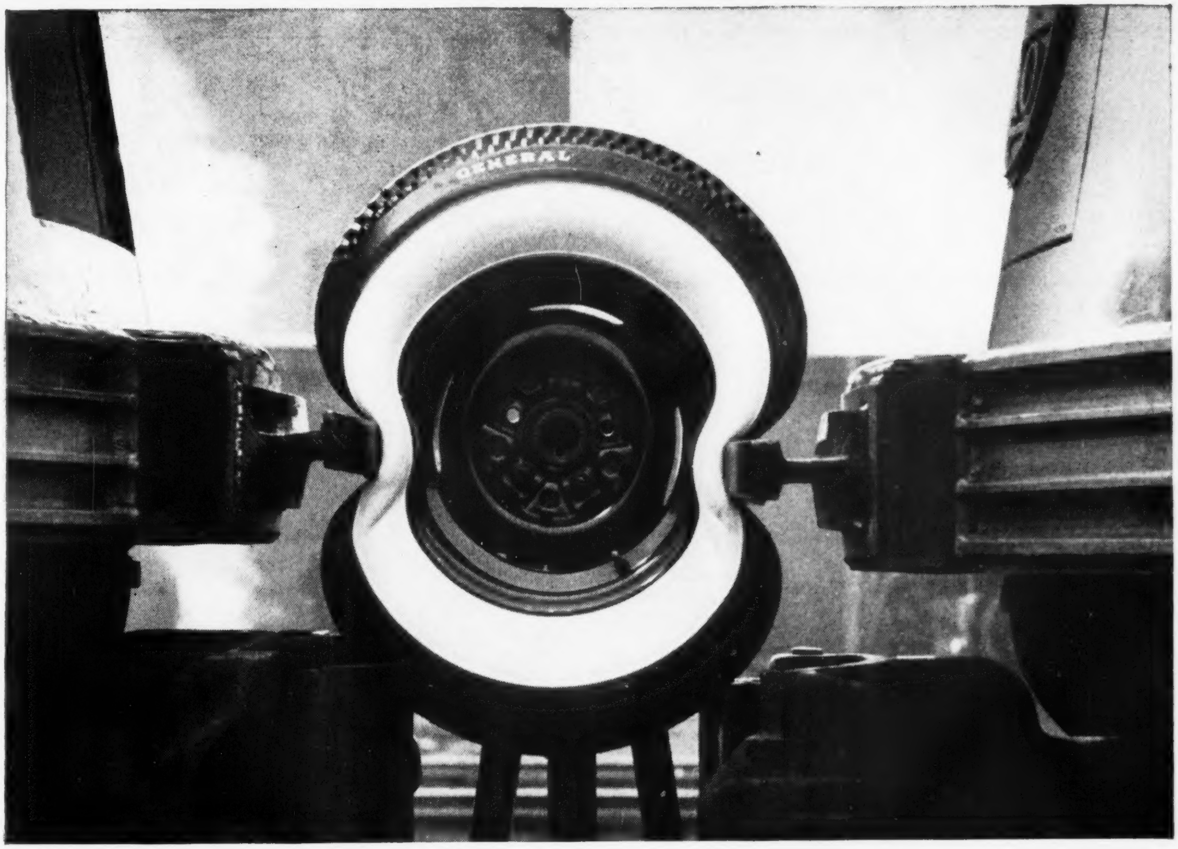
American Enka Corp., New York, N. Y., is now producing a super-strength type of rayon yarn for tires, known as Suprenka.

Baldwin-Lima-Hamilton Corp., Philadelphia, Pa., will distribute in this country the fatigue testing equipment manufactured by Carl Schenk, Darmstadt, Germany, and has granted the German firm the right to the European sale of its own Baldwin SR-4 bonded resistance wire strain gages, SR-4 devices, testing machines, and associated instrumentation.

Barrett Division, Allied Chemical & Dye Corp., New York, N. Y., has appointed Cole & DeGraf to sell, service, and stock its Cumar resins in the San Francisco area.

Clarence B. Sampair has been elected to the board of directors of Minnesota Mining & Mfg. Co., St. Paul, Minn.

Rubber & Asbestos Corp., Bloomfield, N. J., has transferred Martin Pepper, technical service representative, to Los Angeles, Calif., as part of the establishment of resident technical service for West Coast purchasers of Bondmaster, the firm's industrial adhesive.



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News from Abroad

Malaya

Smallholder Replanting Slow

The replanting scheme for smallholders in Malaya does not seem to be making the desired progress despite inducements in the way of increased grants for replanting and a new chemical method of killing trees slated to be cut out, which is not only cheaper and less arduous than the usual methods, but has the further advantage of practically doubling the flow of latex from trees for six to eight weeks before they die. To the end of 1954 not much more than half the target for 1953 and 1954 had been attained; instead of 90,000 acres, only 50,000 acres had been cut out and not quite all of this area replanted. Smallholders had applied for grants to cover 125,000 acres in the past two years, but applications covering only 82,000 acres could be approved.

A. C. Smith, executive officer of the Rubber Industry Replanting Board, found it necessary in the latter part of January to broadcast an appeal to rubber growers, especially smallholders, to replant; he urged listeners to try to convince the smallholder of the gravity of his economic position and the vital need of replanting. One gathers from his talk that too many smallholders are content to idle away their time and neglect to replant in the expectation that the government will help them out of whatever difficulties they may find themselves in, when that time comes.

Rubber Output and Exports

Malaya produced 583,036 tons of rubber in 1954, against 572,792 tons in 1953, an increase of more than 10,000 tons, largely accounted for by the higher outputs on smallholdings—240,230 instead of 231,675 tons. The share of the estates had increased from 341,117 to 342,806 tons.

Final official figures put total exports from Malaya (including imports from Indonesia and other nearby rubber areas) at 915,114 tons in 1954, compared with 847,211 tons in 1953, an increase of almost 68,000 tons.

As in 1953, the principal buyers of rubber from Malaya were the United Kingdom, the United States, France, West Germany, Japan, Italy, Australia, Canada, South Africa, Argentina, and the Netherlands, in that order. There was a falling-off in shipments to Argentina, the United Kingdom, and especially to the United States—as much as 20%—but larger takings by several of the other countries more than made up the difference; West Germany, Japan, France, Italy, Australia, and the Netherlands all stepped up their buying from Malaya in 1954. This recent trend in natural rubber buying has been duly noted, and it has been stressed that it was the increased demand of countries other than the United States that raised total world consumption by 120,000 tons in 1954 and was basically responsible for the price rise toward the end of that year.

The following table shows the amounts (in tons) taken by the above countries in 1953 and 1954:

	1953	1954
United Kingdom	208,897	201,781
United States	181,640	146,804
France	69,102	87,714
Germany	54,750	74,750
Japan	51,619	67,356
Italy	44,037	55,186
Australia	30,149	42,628
Canada	33,290	34,919
South Africa	26,403	27,286
Argentina	22,094	21,499
The Netherlands	10,894	16,704

As to other consumer countries, the members of the Soviet bloc all bought less rubber from Malaya last year; on the other hand, increased industrialization and the establishment of a new tire factory caused New Zealand—which hitherto used negligible amounts of rubber—to buy more than 7,000 tons from Malaya in 1954.

Competition with Synthetic Requires 1s. Rubber

Malaya must be able to offer rubber to consumer countries at 1s. per pound, landed cost, if she is to maintain a competitive position in the world market, F. D. Ascoli, managing director of Dunlop Plantations, Ltd., now visiting Malaya, stated when he urged more replanting by estates. Only by replanting with high-yielding trees could the average yield per acre in Malaya be raised from the present level of about 400 to 1,000 pounds, the rate at which he apparently believes the low price mentioned would be possible. Some Malayan plantations already average about 1,000 pounds per acre, but not nearly enough, he added.

Mr. Ascoli at the same time revealed that Dunlop plans to open new rubber plantations in Nigeria to avoid, as he explained, having "all our eggs in one basket."

Remilling in Singapore Threatened

The Indonesian ban on the export of wet rubbers to Singapore, decreed last July, is still on and, if anything, appears more rigorously enforced. In October, 1954, 14,039 tons of slab rubber entered Singapore for remilling; in November the amount had dropped to 6,599 tons, and in December, to 3,576 tons. As a result of the favorable price levels, there was a sudden increase in arrivals of low-grade rubber around the beginning of this year, which may have suggested that the ruling would be less strictly carried out, but subsequent reports soon made it clear that the opposite was true. The Government of Indonesia continues to hold the view that slab rubber must go to domestic remilling factories for processing into blankets both to improve the foreign exchange position and to provide more employment, an attitude which, while laudable in itself, constitutes a serious threat to the Singapore remilling industry.

It has been stated that the remilling industry here would already have collapsed if it had not been for the action of speculators who imported rubber in time in the hope of profiting by the exchange rate. If the ban continues much longer, the 14 rubber mills in the colony—capable of handling the entire Indonesian output of slabs—will have to close down, throwing another 4,000 persons out of work.

Warns Rubber Growers

The mounting rubber prices in last December, the violent fluctuations as the new year was ushered in, and the subsequent recovery to new heights not reached in more than 2½ years, have kept rubber men guessing. There has been much headshaking by the conservative element; a good deal of playing the market by others, and many conflicting predictions of future trends. Recently the president of the Federation of Rubber Trade Associations of Malaya, Heah Joo Seang, presented his forecast: he estimated consumption by 1960 at 3,600,000 tons and foresaw an acute world shortage of natural rubber in the offing.

Asked by a representative of the press to comment on these statements, Leslie J. W. Bailey, chief purchasing agent in Singapore of Dunlop Rubber Co., Ltd., warned against the danger that such talk of rubber shortages could do to the Malayan industry. He pointed out that there

was a great future for natural rubber at economic prices, and that efficient rubber growers could and would compete with the synthetic product.

On the other hand, rubber goods manufacturers all over the world were watching trends in the natural rubber industry. There were active plans for making synthetic in at least four countries besides the United States and Canada, and the latter had expansion plans under way. Besides, all the synthetic plants would operate to full capacity as soon as a rubber shortage threatened.

While agreeing that there would be a growing demand for rubber, Bailey emphasized that other factors affect the rate of consumption; thus, tubeless tires were likely to make for the use of less, not more, rubber; furthermore, increased retreading, the use of rayon, nylon, and steel in tire carcasses, of Butyl rubber for inner tubes, all would contribute to a reduction in the requirements for new rubber—to say nothing of improvements in existing synthetics and the development of new and better products.

Whether or not 1960 consumption would reach the estimated 3,600,000 tons—50% above the present rate—was not so important to Malaya as what proportion of this consumption figure would be new natural rubber.

"If we talk about an acute shortage now," he was quoted as saying, "then we can be quite certain that by 1960 there will be so much synthetic production throughout the world that natural rubber will already have lost the battle."

To Prevent Spread of Leaf Blight

International cooperation to prevent the spread of the destructive South American leaf disease and other dangerous plant diseases and pests was agreed upon at a recent conference arranged by the Food & Agriculture Organization of the UN and held in Singapore. Delegates from Australia, India, Indonesia, Laos, The Netherlands, Portugal, Siam, the United Kingdom, the United States, and Vietnam joined the local government in an agreement under which each government is to take measures to prevent the spread of leaf blight.

Each government concerned will also try to apply such means to prevent the introduction of other dangerous plant diseases and pests as will be recommended by a regional plant protection committee that will be organized as an advisory body.

Italy

The merger with Pirelli S.P.A., Milan, of the five Italian wire and cable companies which form its cable section has been announced. The companies involved are SICE, Leghorn; FICE, Naples; Fongaro & Cia., Cusano, Milanino; Filati Lucidi, Bergamo; and CAME, Milan.

Indonesia

Hevea Latex-Carbon Black Masterbatch Progress Reported

In Communication No. 219 of the I.N.I.R.O., Bogor, Java, J. L. Billiau reports on the progress that has been made so far in the preparation of *Hevea* latex-carbon black masterbatches. Experiments of this nature have been undertaken in the various research centers in the Far East with a view to preparing masterbatches by which it is hoped not only to save time and material, but also to obtain compounds with improved mechanical properties.

The first attempts along these lines were made in 1950 by J. C. de Neef, of I.N.I.R.O. About two years later Compagnon and Liponsky, of the Rubber Research Center of Indo-China, published their first findings, which indicated that with these masterbatches somewhat better mechanical properties were obtainable; also that loss of carbon black could be considerably reduced, and processing time cut down 30-40%. However Mooney plasticity was very high, resulting in high peak loads during plasticizing and mixing.

The experiments reported on by Billiau were carried out on a masterbatch mix consisting of undiluted fresh latex with D.R.C. of one kilogram, 2.5 kilograms of MPC carbon black dispersion (made up of 20 parts black, one part Darvan, and 79 parts water) corresponding to 500 grams of dry carbon black. The two were mixed together until a coagulum was obtained, which was rolled to crepe about four millimeters thick, and dried at 45° C.

For comparison, smoked sheets were made from the same latex by the usual methods, and tread compounds were made from both rubbers. Despite the very high peak loads during the first contact with the rolls, mixing time and energy consumption of the masterbatches were only about half those of the normal compounds. When tested, the masterbatch samples vulcanized faster and showed greater tendency to scorch than the smoked sheet samples; the important mechanical properties showed no significant improvement, while water absorption was unduly high; at first, tearing strength was somewhat better, but after the samples aged a week at 70° C. (Geer-Evans) the difference in tearing strength disappeared.

In another series of tests, the procedure for preparing the masterbatches was modified to insure better dispersion of the black, and plasticizer was added to improve Mooney plasticity and eliminate high peak loads. The formula now called for undiluted fresh latex with D.R.C. of 0.9-kilogram, to which 100-milliliters of 10% Darvan solution were added; then 2.5 kilograms of the same carbon black dispersion as previously used was mixed with 0.2-kilogram Dutrex emulsion (consisting of 100 parts Dutrex R, 10 parts oleic acid, 5-milliliters of 20% ammonia, and 85 parts water) before being added to the rubber mixture. After thorough homogenizing, 250 milliliters of 10% formic acid were added to coagulate the whole.

Crepe and tread compounds were again prepared as before, and results compared with control samples. The new process yielded a rubber with improved properties; tearing strength again was higher than that of the control samples, but this time continued higher even after aging for one week at 70° C. (Geer-Evans); abrasion resistance also seemed better; Mooney plasticity was on a normal level, and troublesome peak loads no longer appeared. Mixing time was reduced to 22%, and energy consumption to 40%. However, the masterbatches continued to vulcanize faster than the control and showed a greater tendency to scorch.

Results so far achieved are considered promising, although many questions still remain to be answered and problems solved: the effect of type and proportion of stabilizer and softener must be thoroughly investigated; the best coagulation methods must be established; and other types of carbon blacks, as HAF black, must also be tested.

Rubber Shipped to Red China

The latest news indicates Indonesia will ship rubber to China and Russia after all. The Polish vessel, *Polasky*, is understood to have sailed recently from Tandjong Priok, Java, with 6,000 tons of rubber, apparently bound for China.

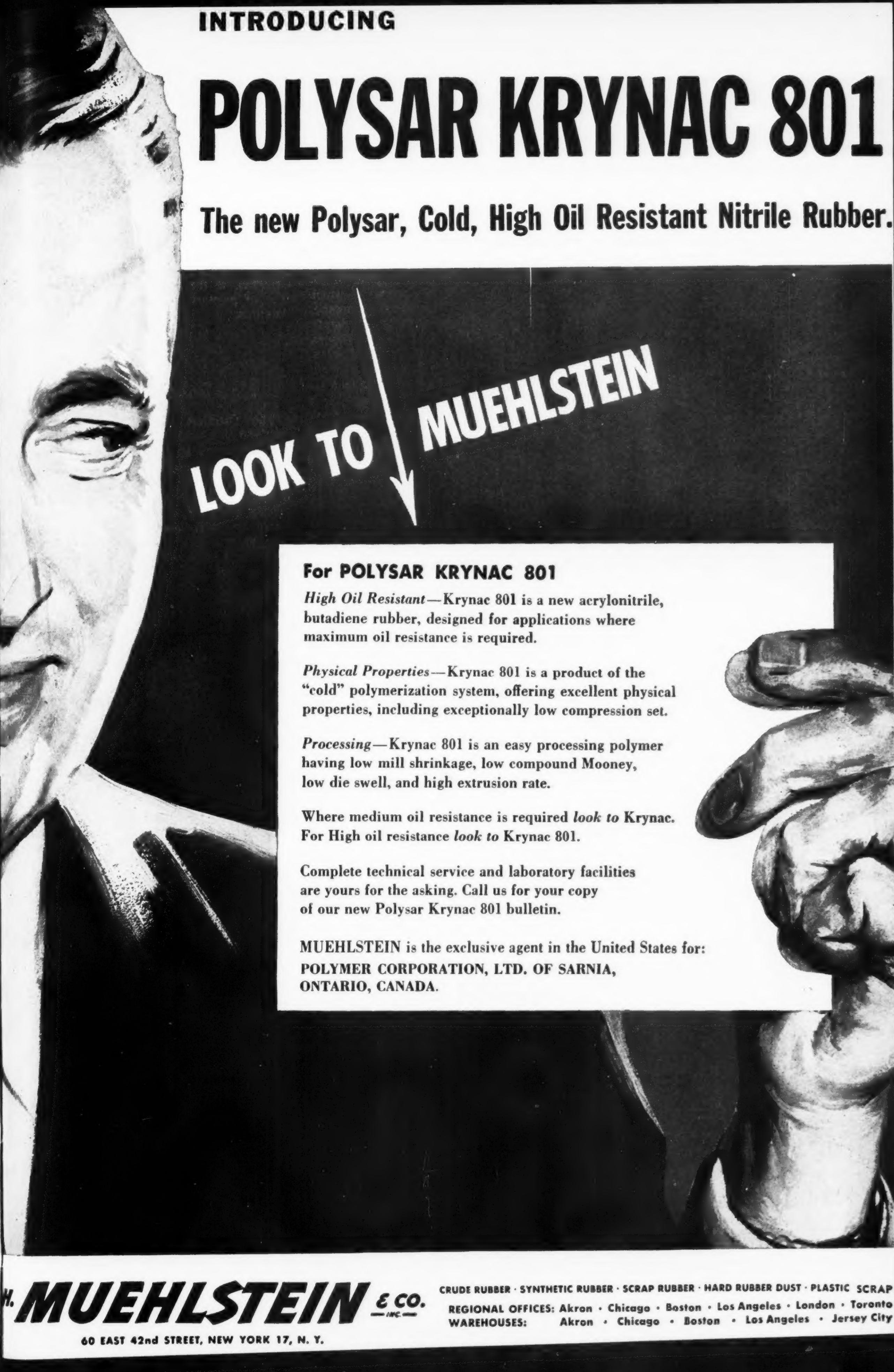
At the same time, reports are abroad that the negotations between Russia and Indonesia, started and broken off repeatedly during more than 18 months, are now to be resumed. The obstacle to agreement was Russia's insistence on buying top grades only; while Indonesia as steadfastly refused to sell any but low grades. Russia now is apparently willing to accept low grades, and the amount of 100,000 tons has been mentioned.

New Auto Plant Planned

German and Indonesian capital — in equal parts—has combined to provide for a new automobile factory in Indonesia. The Borgward company, of Bremen, Germany, and the N. V. Udatin, of Surabaya, Indonesia, have together established the N. V. Borguin, which is erecting a factory at Prapatkurung to produce automobiles and eventually farm equipment and other machinery. The works, expected to be completed in 1955, will be under the technical management of German experts in the initial stages and will employ 600-1,000 persons.

Turkey

Turkey is to import tires from Israel. According to recent reports, import licenses for $400,000 worth of tires from the Alliance works have been issued of late.



Great Britain

Export Trend Continues Upward in 1954

The export trade of the British rubber industry showed continued improvement in the first three quarters of 1954. Tire exports, which had dropped abruptly from a high of 11,706,231 units in 1951 to 8,644,097 in 1952, rose to 9,467,381 units in 1953, a figure almost reached in the first nine months of 1954, when the total was 9,200,019 units.

As to general rubber goods, a comparison, on a quarterly basis, of exports in 1953 and the first eight months of 1954 with those for 1952 reveals an upward trend which in most cases became marked in the fourth quarter of 1953 and continued through the 1954 period. Totals for the most part were still substantially below the 1951 peak, and even the early 1952 peak, and there was a dip in the third quarter of 1953, which brought the figure for that period well under the quarterly average for all of 1952; but there was no repetition of the depths recorded in the middle of 1952.

The dip in 1953 reflected reduced sales of most kinds of goods, especially tubing and hose, hard rubber, cellular rubber; however, even during the poorest quarter of 1953, there was an upswing in footwear, rubber flooring, surgical goods, hot water bottles, and miscellaneous goods. Thereafter exports of most of these goods as well as of cellular rubber, toys and rubber sheeting, moved considerably above the level of the quarterly average for 1952, which, it should be remembered, takes in not only the steep fall in the middle of the year, but also the peaks at the beginning and the end. On the other hand, the best figures of 1953 and 1954 for rubber and rubber and canvas belting were still a long way below the quarterly average of 1952, probably owing to the inroads of plastic belting.

The values, in £ per quarter, for the period considered, compared with the quarterly average for 1952, works out as follows:

Quarterly average, 1952	3,528,226
1953—1st quarter	3 267,862
2nd quarter	3 201,176
3rd quarter	3,065,438
4th quarter	3 492,960
1954—1st quarter	3,563,674
2nd quarter	3,476,073
July and August	2,447,564

The British Commonwealth continues to be the best market for Britain's rubber manufactures, the Union of South Africa, Australia, New Zealand, and Canada, each individually being among her best customers. Other ranking customers are Sweden, Eire, the Netherlands, Belgium, France, and Italy. The United States is one of the biggest buyers of British toys, balls, and football bladders, being a close second to Canada and New Zealand. Western Germany also buys a relatively large amount of British rubber toys and balls. A fair amount of business is also done with Peru, Uruguay, and Venezuela in South America, and in the Near East, with Lebanon and Syria and Iraq.

F. D. Ascoli Honored

The 1954 Hancock Medal of the Institution of the Rubber Industry has been awarded to F. D. Ascoli, a director of Dunlop Malayan Estates, Ltd., and of Semtex, Ltd.

Mr. Ascoli has been connected with the plantation end of the Dunlop business for the past 29 years, in the course of which he introduced and developed a number of important projects, including budgrafting programs, centralized control of estates, latex centrifuging, bulk shipment of latex, etc. He has been a member of the advisory committee to the Commissioner for Malaya since 1948, is a member of the Council of the Rubber Growers' Association (of which he was chairman in 1948), and in general has been very active in various fields on behalf of rubber.

Rubber Text Books for Students

The British rubber industry has taken the direct method of solving the problem of providing the rubber text books it needs, particularly for use by students. About a year ago the Institution of the Rubber Industry appointed a sub-committee representing almost every section of the industry to go over the available range of text books and to offer suggestions for filling important gaps. After the group had decided what was wanted and what books were already in preparation, it found that the most urgent needs at student level were: two books on rubber technology, covering principles and manufacturing methods, at L.I.R.I. and A.I.R.I. standard, respectively; rubber chemistry and physics, preferably up to A.I.R.I. standard.

Then the appropriate institutions were asked for their cooperation, and now it is learned the staff of the National College and of the B.R.P.R.A. will undertake to provide the above wants.

Waste Rubber for Bricks

Ground waste rubber can be used with interesting results in the manufacture of bricks, J. S. Leach, president of the Waste Rubber Merchants' Association, reported at a meeting in October, 1954, in Manchester. Tests were conducted in collaboration with the Department of Scientific & Industrial Research, in which rubber dust and buffings had been mixed with the clay, and it was found that gas, generated by the particles of rubber when the bricks were fired, caused tiny holes throughout the brick, resulting in a much lighter brick having good insulating properties and far greater strength than the usual types of aerated bricks.

Wallace Micro Hardness Tester

Originally designed for carrying out hardness tests on rubber components too small or on sheet material too thin to be tested by the usual means, this instrument can also be used for hardness or indentation tests on all types of plastics, both flexible and rigid. Used as a comparator, the device will measure thickness to an accuracy of 0.0001-inch or closer if necessary. A special application of this device, put out by H. W. Wallace & Co., Ltd., Croydon, is the examination of the surface of printers' blankets for minute undulations.

New Polystyrene Firm

The Distillers Co., Ltd., Edinburgh, Scotland, holds the controlling interest in a British company recently formed jointly with Dow Chemical Co., Midland, Mich., U.S.A., to manufacture polystyrene and modified polystyrene. The new concern, known as Distrene, Ltd., will operate at Barry, in South Wales, under Dow company patents. Its sole selling agent is Resin Products, Ltd., a wholly owned subsidiary of Distillers.

France

Establish Center of Macromolecular Research

A Center of Macromolecular Research (R.C.M.) was inaugurated in Strassburg on October 6, 1954. Created by the National Center of Scientific Research with the aim of promoting fundamental research in the field of the macromolecule, now of such industrial as well as biological importance, the new center is the first of a series of similar institutes, each with its own special task, to be established with the purpose of extending the possibilities of French scientific research.

The R.C.M. represents the realization of a long-cherished idea of Prof. Sadron, of the faculty of science at the University of Strassburg. The R.C.M. building, not far from this University, occupies 900 square meters, has three floors and a basement, and provides about 3,000 square meters of space for laboratories for the physical, chemical, and biological sections.

For the present, the physical section will take up the methods of investigating dilute solutions of high polymers; in the biology section, macromolecular biological substances (proteins and nucleic acids) will be prepared and studied; while the chemistry section will prepare new products by synthesis and polymerization.

The official opening of R.C.M. was combined with a conference held October 4, 6, and 8, when a number of French and foreign experts presented papers including: "Macromolecular Chemistry, the New

Branch of Organic Chemistry," H. Staudinger (Germany).

"The Molecular Dynamics of High Polymer Formation," H. W. Melville (England).

"Some Aspects of Polycondensation," P. J. Flory (U.S.A.).

"The Physical States of Macromolecular Substances," J. J. Hermans (Netherlands).

"Structure and Properties of Plastomers," G. Champetier (Paris).

"Problems of the Manufacture of Synthetic Fibers," R. Signer (Switzerland).

"Synthetic and Artificial Elastomers," G. Natta (Italy).

"Interactions between Polyelectrolytes," A. Katchalsky (Israel).

"New High Polymers in Industry, Agriculture, and Medicine," H. F. Mark (U.S.A.).

"Industrial Development of Plastics," M. Fréjacques (Paris).

"From Research Laboratory to High Polymer Industry," P. Piganiol (Paris).

Gas Permeability Related to Compound Structure

A study[1] on gas permeability of mixes of natural rubber containing increasing proportions of other elastomers revealed the significant fact that improvement thus achieved depends not only on the gas permeability of the synthetic itself, but also on a factor which appears to be a function of the internal structure of the compound.

The materials tested, including Vistanex, Paracrils 26 and 35, Hycar OR-15, Neoprenes W and Q, and Thiokol FA, were exposed to nitrogen at 60° C. A simple method was devised for calculating the permeability of a mixture containing *n* parts of a synthetic rubber, when the permeability is known of the elastomer alone and of any mixture of the same elastomer with natural rubber.

Attempts to study the internal structure of mixes by the usual microscopy methods were unsuccessful, but encouraging results are claimed in the case of a compound of Paracril 26 and natural rubber when the loss factor was measured by radio-electric frequencies.

[1] *Rev. gén. caoutchouc*, 31, 5, 393 (1954).

Degradation of GR-S in Solution

The phenomenon of scission occurring in the GR-S molecule when the polymer, in solution, is exposed to the action of air, was the subject of research carried out by J. Cortyl-Lacau.[1] The mechanism of the reaction is thought to be as follows:

At first there is an induction period of 4-5 hours, at 110° C., during which oxygen is absorbed without causing any change in saturation, any scission reaction or formation of stable peroxides. On the basis of prior findings by others in connection with polymerization research, it is suggested that the absorption of oxygen by the solution is accompanied by formation of a complex of undetermined nature, which acts as a supplier of oxygen and favors any oxidation reaction taking place within the solution.

When the oxygen begins its attack, it is at the double bond, rather than at the alphamethylene carbon, as in the chlorination of rubber, and a peroxide radical is formed:

$$\mathrm{R{-}CH{=}CH{-}R'} \longrightarrow \mathrm{R{-}CH(O\dot{O}){-}\dot{C}H{-}R'}$$

This in turn would add a molecule of oxygen, yielding a diperoxide radical:

$$\mathrm{R{-}CH(O\dot{O}){-}CH(O\dot{O}){-}R'}$$

It is this very active diperoxide radical which is held solely responsible for saturation and scission reactions, which it apparently brings about by attacking other double bonds, thereby producing further peroxide radicals for continuing the chain.

This mechanism is confirmed by calculation of the activation energies and the order of the reactions of scission, saturation, and peroxidation.

[1] *Rev. gén. caoutchouc*, 30, 11, 819 (1953); 31, 6, 473 (1954).

Merger Reported

Negotiations are reportedly under way by which Pneumatiques et Caoutchouc Manufacturé Kléber-Colombes (French Goodrich) will absorb S.I.T., a branch of the Compagnie Générale d'Electricité, which specializes in the production of rubber goods.

Germany

Silica Pigments Equal Carbon Black in Packings

A series of investigations has been started by P. Kluckow[1] to develop a compound for packings with high elasticity under pressure at high temperatures in mineral oils, which do not swell in hot water or shrink in hot oil.

To begin with, the action was studied of highly dispersed silicic acids in three types of nitrile rubbers—Perbunan W (2810), Hycar 1042, and Polysar N 301, in compounds consisting of 100 parts rubber, 100 filler, 20 dibenzylether, five zinc oxide (Red Seal), two sulfur, and two Vulkacit DM, vulcanized for 20, 40 and 60 minutes at 143° C.

The fillers included KS a, b, and c (three active silicic acids of different origin, all obtained by precipitation) and, for comparison, two alumina gels, Teg a and b; Al-Sil (active aluminum silicate); two carbon blacks, CK 3 and Carbon Black 101; and NKK (Neuburg silicic acid chalk, non-active). Very many tests were conducted, and from the results the best values for tensile strength, elongation, and stress, the averages of four parallel abrasion tests, and the averages—at the two higher temperatures—of eight tests each for hardness and elasticity, were selected and arranged in a table.

Analysis of the table shows:

(1) All fillers indicated greater hardness and lower elasticity than NKK, included as an example of a non-active filler.

(2) Higher elasticity values were reached throughout with Perbunan than with Polysar N 301 or Hycar 1042. After NKK, the Teg fillers gave the highest values, and CK 3 the lowest.

(3) The highest tensile strength values were obtained with the three highly disperse silicic acids and CK 3; the differences, as compared with NKK and Teg, were especially large.

(4) In the case of Shore hardness, tensile strength, elasticity, and elogation, the type of rubber had a considerable effect on results where the light-colored fillers were concerned; these values accordingly, showed greater variations than in the case of the blacks, particularly CK 3. In the latter case, the author suggests, the variations are probably much smaller because of the difference in surface activity, which is less for carbon blacks than for the light, hydrophilic reinforcers.

(5) Abrasion resistance was highest with CK 3, but similar values were attainable with the active silicic acids, if the margin of error in the tests was taken into consideration.

(6) On the other hand, tear strength of CK 3 was unexpectedly low, being under that of Carbon Black 101, as well as under that of KS a, b, and c.

In general, it is concluded, mixes of active silicic acids in nitrile rubbers give hardness, tensile, and structural strength values on a level with those of carbon black compounds. Perbunan is seen to rank first in regard to impact-elasticity, permitting the inference that its behavior in cold would be as superior.

Investigations are to be continued on similar rubber mixes, but including triacetin and other plasticizers.

[1] *Kautschuk u. Gummi*, 7, 8, WT 183 (1954).

German Trade Notes

By agreement between the German Federal Government and the Berlin District, the former National Materials Testing Office in Berlin-Dahlem and the former Government Institute of Chemistry & Technology incorporated with it since August 1, 1945, have been taken over by the Federation and is in future to be known as the Federation Institute for Mechanical & Technical Materials Testing. The new organization will promote materials testing—collecting, arranging, and evaluating all the literature pertaining to domestic and foreign experience and making them available to specialists, and also will represent German materials testing at home and abroad.

Germany has opened in Hamburg its own bulk storage installation for latex. The installation, the third of the kind in Continental Europe, was built by the German-Netherlands firm, Blaufries Veem in Hamburg, and has a capacity of 1,000 tons; the annual latex turnover in Hamburg is estimated at about 10,000 tons.

New Equipment

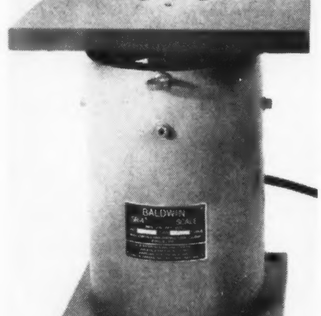
Air Filter in Clear Plastic Cylinder

Transparent air filter of Beach Precision Parts Co.

A clear plastic cylinder has been added to the line of compressed air Sta-Dri oil and moisture separators of Beach Precision Parts Co., Boonton, N. J. Designed to show when the filter elements should be replaced or when the moisture should be drained from the bottom of the separator, the unit, called Model #65C, is 12 inches long and 2½ inches in diameter.

With its ¼-inch plastic walls tested to withstand pressures in excess of 600 pounds, the filter is intended for use on compressed air lines of up to 250 pounds' pressure. Approximate cleaning capacity of the two silk-encased filters in each cylinder is reported at a million cubic feet. Use in the rubber and plastic industries, where clean dry air is essential to the quality of the product, is recommended.

Platform Scale for Remote Weighings



Baldwin SR-4 Platform Scale

A new floor-level platform scale that permits the use of a variety of instrumentation for remote electrical measurement such as indicators, recorders, and control equipment has been introduced by Baldwin-Lima - Hamilton Corp., Philadelphia, Pa. This scale has a 500-pound capacity and can be set in a pit 10½ inches square and less than 12 inches deep.

The operation of the scale is effected by a single load cell of compression type in which bonded resistance wire strain gages are the load sensing elements, the company reports. The cell supports a platform on a short column which is held vertical by two sets of radial flexure straps. Only direct vertical loads can be measured, regardless of the position of the load on the platform. Extremely low power output with remote electronic amplification is said to be a safety feature.

Temperature Transmitter

A non-indicating temperature transmitter that is compensated for ambient temperature and barometric pressure variations has been introduced by Foxboro Co., Foxboro, Mass. Called Model 12A Temperature Transmitter, the device is of the "force balance" type and has a calibrated accuracy of ½% of the temperature span, according to the company.

Foxboro Model 12A Temperature Transmitter with stainless steel capillary and bulb

The device is designed around a gas-filled thermal system which exerts force on a flapper-nozzle mechanism in proportion to the measured temperature, Foxboro says. The resulting back pressure in the nozzle circuits, amplified through a relay and converted to a force through a bellows, balances out the initial force and constitutes 3-15 psi. output transmitted by low-cost tubing to a receiving instrument.

Three-and-a-half feet of Geon-protected capillary tubing connects the temperature bulb to the transmitter, the company says. A block and clamp mounting arrangement secures the instrument to any vertical or horizontal pipe or flat surface. It is said to be weatherproofed, permitting installation in hazardous or corrosive outdoor areas. Weight is seven pounds.

Double-Stirrer Change Can Mixer

#30 DM Mixer of Charles Ross & Son Co., Inc.

A new change can mixer for heavy and viscous materials, designed with two stirrers that are said to achieve faster and more effective mixing because they sweep by each other and the inside of the can with close tolerances, has been put on the market by Charles Ross & Son Co., Inc., Brooklyn, N. Y. Called #30 DM Double Motion Change Can Mixer, the apparatus is engineered so that the can does not revolve, enabling it to be fitted with a slide lever gate at the bottom for emptying the can, aided by the action of the stirrers.

The mixing action is so effective, the company says, that very often a desired dispersion results, cutting production costs. The stirrers, each revolving on its own axis, sweep the entire cubic area of the can, top to bottom, eliminating the formation of inert pockets. Another feature of the mixer's design is a raised base to permit the use of a lift truck in order to move the cans to and from the apparatus.

The #30 DM is available in production sizes of 20, 60, and 80 gallons.

New Products

Tire for Front Tractor Wheels

Goodyear Farm Rib Tire

A popular-price farm tire for front wheels of tractors, designed with three continuous ribs for ease of steering and a wider tread for improved flotation in either sandy or heavy soil, has been introduced by Goodyear Tire & Rubber Co., Akron, O. Called the Farm Rib, the tire is meant primarily as a replacement article and supersedes the firm's former Marathon tire.

According to the company, tread wear has been improved through the use of long-lasting rubber compounds, and durability has been increased by means of high-tensile beads which hold the tire securely on the run. Made in all popular front-tire sizes from 4.00-15 through 6.00-16, the Farm Rib also is manufactured in an additional size not previously available in its predecessor, 4.00-19.

Seamless, Unplasticized PVC Valves

All-molded, seamless, unplasticized polyvinyl chloride valves have been introduced by H. N. Hartwell & Son, Inc., Boston, Mass., distributor of pipe, fittings, rods, blocks, sheets, and special fabrications, all sold under the Boltaron 6200 trade mark. PVC materials manufactured by the Bolta Division of The General Tire & Rubber Co., Akron, O.

The new valves, available in one- and two-inch sizes, are the first of their kind designed and engineered by The Lunkenheimer Co., Cincinnati, O. Maximum service temperature is reported as 140° F., and working pressure as 125 pounds. Resistant to most industrial chemicals and reagents, these valves have high flow characteristics, will not rust or scale, and weigh about half as much as similar aluminum valves, it is further claimed.

Featured is a streamlined body to reduce turbulence; a handwheel with rounded lugs to insure positive closing; a packing nut with easily tightened built-in gland; a stem that has large Acme threads and long engagement for rapid operation; packing made of self-lubricating Teflon; a generously dimensioned bonnet that includes back-seating surfaces for easy repacking under full pressure; and a disk that swivels on the stem for self-centering action.

Goodrich Tubeless 6.50-16 Truck Tire

A tubeless, puncture-sealing, heavy-duty truck tire in 6.50-16, 6-ply size has been announced by The B. F. Goodrich Co., Akron, O. Made specifically for mounting on drop-center rims, the new tire has a "grip block" tread which is said to assure skid protection in any driving condition. Recapping and repairing can be done through conventional methods and equipment, according to the company.

New Royal Master Tubeless Tire of U. S. Rubber Co.

Royal Master Nylon Tubeless Tire

A new Royal Master tubeless tire made with nylon cord treated with a new kind of liquid latex, and incorporating white sidewalls, recessed to prevent scuffing, has been introduced by United States Rubber Co., New York, N. Y. Protection at sustained high speeds, silent performance, and a 22% gain in mileage over the firm's previous Royal Master design, are claimed for this new tire.

According to the company, the nylon cord has been pre-stretched without loss of strength or shock-absorbing abiilty. An extra rubber strip has been added at the tire bead to prevent the tire from pulling away from the rim to break the air seal during severe cornering. The special rib design of the tread is said to minimize squeal, and the grooves have been designed dog-legged to throw out pebbles and gravel.

Improved Rear Tractor Tire

A rear tractor tire said to represent a 51% increase in wear and designed with a double-braced lug to improve its adaptability to travel over hard-surfaced roads, also comes from U. S. Rubber. Called U. S. Royal Super Grip Master, this tire is reported to be made with extra-tough compounds that boost its abrasion resistance.

The tire is braced on both leading and trailing edges of the lugs to stabilize it against scuffing from bar flexing or layback, according to the company. This double bracing is said to reduce greatly uneven tread wear, as well as to achieve high pulling power. A wide self-cleaning tread has also been incorporated.

A padded rolling center on the tire reduces vibration and helps cushion the ride when tractors are used on hard surfaces.

The tire is available in 53 sizes ranging from 8-24 two-ply through 15-34 eight-ply.

Foam Rubber Mattress Pad

A foam rubber mattress pad, reinforced with fabric backing to prevent wrinkling or tearing, has been introduced by The Dayton Rubber Co., Dayton, O. Called Dayton Koolfoam Slumber Pad, it is ⅜-inch thick and is said to provide the advantages of a full foam rubber mattress at a fraction of the cost.

Manufactured in two sizes, 36 by 70 and 50 by 70 inches, the pad is lightweight, durable, washable, and allergy-free, according to the company.

Technical Book Shelf

BOOK REVIEWS

"The Story of Tire Beads and Tires." Walter E. Burton. McGraw-Hill Book Co., Inc., New York, N. Y. Cloth, 6 by 9 inches, 206 pages. Price, $5.00.

This is a handsomely designed, interestingly written, and profusely illustrated book which traces the evolution of the component parts of the modern tire, describes the manufacture of these parts today, and generally serves as an almanac of facts and figures in the care and characteristics of the tire. The author is particularly concerned with tire beads, which he considers the very foundation of the pneumatic tire, and he carefully scrutinizes every aspect of their history and manufacture.

Under other uses for wire with rubber the author mentions wire in place of fabric for tire carcasses and also wire in tire treads for improved traction. Then also there is mention of wire in belting, and for high-pressure hose. Future developments are aimed at elimination of corrosion, improvement of adhesion of wire to rubber, and new ways of employing wire in combination with both rubber and plastics.

"Handbook of Textile Fibers." Edited by Milton Harris. Harris Research Laboratories, Inc., Washington, D. C. Cloth, 8 by 11 inches, 364 pages. Price, $12.50.

This notably definitive textile handbook should prove invaluable to laboratory workers, scientists, businessmen, and others engaged in the textile field or related fields, although the volume's prime concern is to aid the textile researcher. Covered are textile terms and definitions; fiber types and sources, including names and addresses of foreign and domestic producers; physical and chemical property tables and graphs; effects of biological agents; outlines of methods of identification; yarn numbering and count systems; chemical and engineering tables; economic and production data; and a list of textile periodicals. The sections on microscopy and X-ray diffraction characteristics, illustrated with photographs of most of the known natural and synthetic fibers, are particularly commendable.

"Materials for Product Development—1954." Clapp & Poliak, Inc., New York, N. Y. Cloth, 6 by 9 inches, 159 pages. Price, $7.50.

The volume contains the texts of 13 papers delivered before the Basic Materials Conference, held in conjunction with the Second Basic Materials Exposition, Chicago, May, 1954. The papers deal with six basic problems: materials of the future; new metal forming processes; non-metallic materials, including plastics, carbon-graphite, ceramics, and glass; joining, with emphasis on adhesives and adhesive bonding of metals and plastics; corrosion protection; and materials management, describing the methods of setting up and operating a materials department. Many of the papers are followed by verbatim transcriptions of valuable question-and-answer sessions. The book is free to those who attended the conference.

NEW PUBLICATIONS

"Specifications for Scrap Rubber." Revised January 25, 1955. The Rubber Reclaimers Association, Inc., New York, N. Y. 4 pages. Superseding specifications issued January, 1954, these contain minor wording changes in paragraphs relating to foreign scrap, packages, claims, and standard grades.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.:

"Neoprene Latex Addition to Paper in the Laboratory." PR-7, 1-15-55. J. S. Hickman. 4 pages. A typical laboratory procedure for the addition of neoprene latices to paper pulp slurries for coating purposes is described. Typical formulae are also reported.

"Age-Resistant Hot Water Bottle Compounds." B1-276. R. W. Bedwell. 4 pages. Sample recipes and comparative physical test data for three grades of natural rubber hot-water bottle materials employing Zenite A accelerator to improve aging characteristics are reported. The use of "Hypalon" in varnishes for such products is also covered.

"Aquarex L." Report No. 55-1. C. J. Higgins and D. B. Forman. 6 pages. The properties and uses of Aquarex L, a corrosion-inhibiting mold release agent that provides effective treatment for freshly mixed stock to remove tack and acts as a lubricator for steel conveyors carrying synthetic rubber during manufacture, appear in this booklet.

"Thiuram M." Report No. 55-2. W. G. Ogden. 16 pages. The properties of Thiuram M (tetramethyl thiuram disulfide), a fast-curing accelerator and vulcanizing agent, are here discussed, and its diverse uses, such as providing resistance to heat aging in low or non-sulfur stocks, and acting as secondary accelerator in conjunction with acidic accelerators, are dealt with.

Publications of Dow Corning Corp., Midland, Mich.:

"Silastic Newsletter," Vol. II, No. 5. 5 pages. Discussed here is the company's Silastic fabrication laboratory which assists firms in solving their silicone rubber processing problems and evaluates newly developed Silastic compounds. Miscellaneous test data on Silastic's properties are included.

"Silastic Newsletter." Vol. II, No. 6. 4 pages. Included in this issue are data showing that the firm's Silastic 50 and Silastic 80 are comparable to the best low compression set silicone rubbers; methods for bonding Silastic parts to metals without heat or pressure by means of Dow Corning A-4000 adhesive; the curing of Silastic 152 and Silastic 675 to obtain optimum properties; and a bibliography of recently published articles on silicone rubber.

"Silicone Notes." Reference 4-603. 3 pages. Properties, performance, and application of Dow Corning A-4000 adhesive are discussed.

"Silastic Facts." Reference 9-353. 2 pages. Properties and applications of Silastic 123, a low consistency, general-purpose silicone rubber paste useful for coating and calking, are outlined here.

"Silastic Facts." Reference 9-355. 2 pages. Properties and applications of Silastic 6-128, an extreme temperature, translucent silicone rubber paste for coating cloth and for electrical uses, are covered.

"Silastic Facts." Reference 9-356. 2 pages. Properties and applications of Silastic 7-171, a medium durometer, low compression set silicone rubber stock with advantageous dielectric properties, are presented.

Publications of Godfrey L. Cabot, Inc., Boston, Mass. (see p. 789):

"General Properties, Functions, and Uses of Cab-o-sil." No. CGen-1. 7 pages.

"Cab-o-sil in the Rubber Industry." No. CMis-1. 7 pages.

"Aqueous Dispersions of Cab-o-sil." No. CMis-2. 4 pages.

"Chemical Progress." Vol. 1, No. 1. Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y. 8 pages. The first in a new series of reports concerning chemical developments at the company and throughout the chemical industry, this issue discusses such subjects as the Oxo process for the synthesis of chemicals, the dehydration of natural gas by means of glycols, the lubrication of kiln-car bearings with Ucon synthetic lubricants, and the use of ethyl silicate in precision investment casting.

"The SAE Story." The Society of Automotive Engineers, Inc., New York, N. Y. 56 pages. This is the history of the SAE—its founding, growth, and current organization and functions—which is now celebrating its fiftieth anniversary and boasts a membership in excess of 17,000.

"Filter Fabric Facts." Wellington Sears Co., New York, N. Y. 16 pages. Filtration principles, devices, media, and employable textile fibers are described in this illustrated booklet.

" 'BRC' 22 Hydrocarbon." Rubber Laboratory Release No. 14. Barrett Division, Allied Chemical & Dye Corp., New York, N. Y. 20 pages. Physical and chemical data and sample recipes and performance characteristics in natural rubber, GR-S, neoprene, and Hycar stocks of the company's "BRC" 22 Hydrocarbon, a reinforcing-type softener developed as a substitute for the discontinued "Carbonex" Hydrocarbons, are reported in this booklet.

"Elastomers—Plastomers." January, 1955. Foster D. Snell, Inc., New York, N. Y. 4 pages. The first in a series of news letters, this publication contains a discussion of the enormous advances synthetic rubber has made to the detriment of the natural product and what the British, particularly concerned, are doing about it.

"Organic Syntheses Based on Ortho-Nitrochlorobenzene." Monsanto Chemical Co., St. Louis, Mo. This is a 35- by 44-inch wall chart showing diagrammatically more than 120 organic syntheses based on ortho-nitrochlorobenzene (ONCB). Also included is a literature summary of potential uses for 19 of the more important ONCB derivatives, many of interest to the rubber industry.

"Directory of Commercial and College Testing Laboratories." American Society for Testing Materials, Philadelphia, Pa. 48 pages. Price, $1.00. Successor to a similar directory published by the National Bureau of Standards in 1947, this booklet contains alphabetical and by-state listings of 278 commercial testing laboratories and 86 college laboratories prepared to do testing under certain conditions. Included are names, addresses, commodities that can be tested, and the nature of such tests.

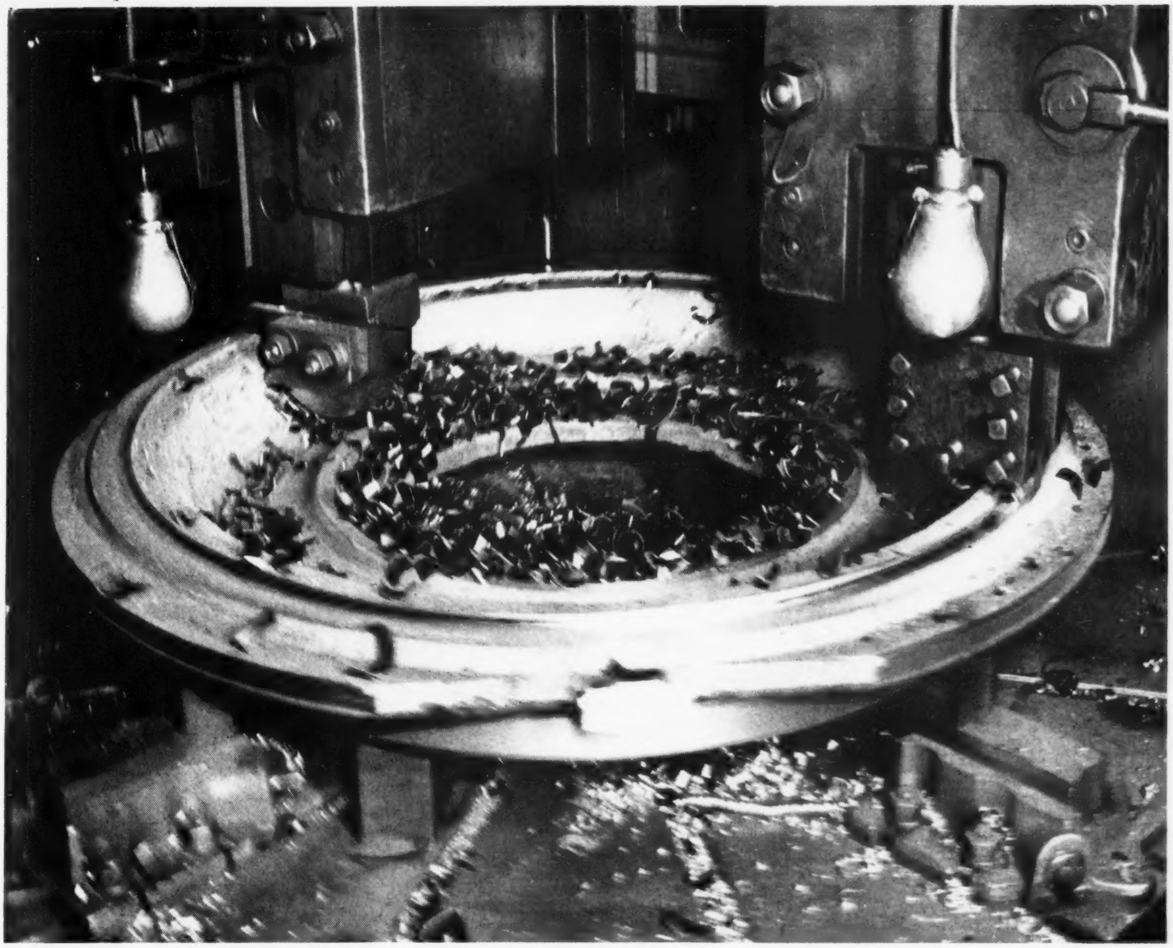
"Standard Samples and Reference Standards Issued by the National Bureau of Standards." NBS Circular 552. National Bureau of Standards, United States Department of Commerce. 26 pages. Price, 25¢. This booklet contains a descriptive listing of the various Standard Samples issued by the National Bureau of Standards, a schedule of weights and fees, and summarized tables of analyses to indicate the type of standards of composition presently available.

"Rubber in a Nutshell." Rubber-Stitching, Delft, Netherlands, 18 pages. This 1955 edition of the company's 2½- by four-inch booklet contains a multitude of facts on rubber, such as world production, consumption, stocks, and prices, mechanical properties of vulcanized rubbers, and filler data, and is concisely illustrated with graphs and tables. It is available in this country from the Natural Rubber Bureau, Washington, D. C.

"Chronological List of Technical Papers from the Government Synthetic Rubber Program." DRP-5-S2. Research & Development Division, Office of Synthetic Rubber, Federal Facilities Corp., Washington, D. C. 9 pages. Here listed is a 1954 compilation of published research papers reporting the work of university, institute, and company laboratories sponsored by OSR or its predecessors. This is the second supplement to the list, DRP-5, issued July 3, 1953.

"Tested Accident Prevention Safety Equipment and First-Aid Supplies." General Scientific Equipment Co., Philadelphia, Pa. 130 pages. The firm's latest catalog of industrial, mine, utilities, and farm safety equipment covers such items as respiratory devices, eye protection, hats, gloves, carboy pumps, and drum pumps.

"Ceramic Tile Adhesives for Floors." Minnesota Mining & Mfg. Co., Detroit, Mich. 4 pages. This technical data sheet on the firm's CTA-12 rubber-base adhesive for clay floor tile describes its physical and chemical properties and methods of use.



This forging will be *Another*
BRIDGWATER TIRE MOLD

MAKING its *first* stop on the production line of Bridgwater's Athens Machine Division, in Athens, Ohio, is this rough forging for an automotive tire mold. 10 to 14 stops later—depending on its type and size — the forging will emerge, mirror-polished, precision engraved . . . a *finished* Bridgwater Tire Mold. It is ready, then, for the production line of a tire plant — perhaps yours — where its higher quality and greater workability will contribute conspicuously to smoother, speedier flow of quality tires.

Typical of our "scope" at Athens is that this Vertical Boring Mill is only one of 11 available in our plant. Typical also of Bridgwater's *continuing* efforts to streamline mold making processes, is that these mills are now being fitted with tracer control equipment which will substantially reduce the time — and cost — of the machining operation shown here.

Tire mold production at Athens is unique in that our *entire* organization of trained technicians and metalworking craftsmen — all equipment and machines — much of it our own special design — and our systems of production "flow" are unhampered by any other manufacturing obligation. In fact, the Athens Machine Company is the *only* plant in the world devoted exclusively to tire mold making.

That's why, at Athens, you can get precision-made molds of any type and size, in engraved steel, cast iron or aluminum, *faster,* and at costs that reflect favorably in a period of adjusting economy.

ATHENS MACHINE DIVISION

BRIDGWATER MACHINE COMPANY

Akron, Ohio

1896

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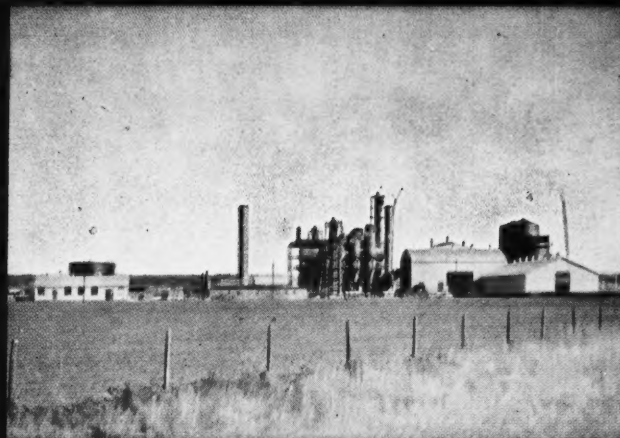

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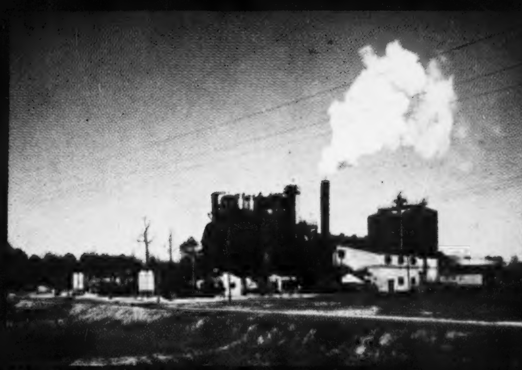

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MARKET REVIEWS

Rubber

Prices on both the spot and futures markets continued to shoot upward during the period from January 16 to February 15, except for a slight slackening caused by the suspension of activities on the Singapore market, January 24 and 25, the Chinese New Year holidays. On February 10 persistent rumors were in circulation that the U. S. General Services Administration was on the verge of drastically revising its stockpile policy, and the market reacted with dramatic suddenness, sending prices steeply downward. On February 16 these reports proved true; the GSA announced it would step up by 50% the rate at which it would replace low-grade natural rubber in the defense stockpile with higher, longer-storing grades. Prices on both the Singapore and New York markets continued to fall, and of this writing it is uncertain when a recovery can be effected.

The GSA ruling aside, trading on the Commodity Exchange was again heavy during the period; lots exchanged exceeded 100 on all but three days and mostly remained in the high 100's. R.S.S. #1 climbed to 38¢ a pound on February 11, a record level since June, 1952, the final month of GSA-set prices, which had also seen the #1 grade at an established 38¢.

Many factors contributed to this rise. Politically, the Formosan situation and Red Chinese bellicoseness brought the prospect of far-flung hostilities closer than it had ever been since the end of World War II, and the Kremlin shake-up aggravated the general nervousness. Industrially, U. S. consumption figures for December showed that 119,000 tons of new rubber had gone into production uses, an excess of 14,500 tons over rubber arrivals during the month; and free stocks on December 31 represented less than two months' consumption at the prevailing rate.

These considerations created an ominous portrait of short supply, both immediate and long-range. Observers agree that American producers had underestimated their stock position in relation to requirements. Even such a normally influential factor as the probable boost in synthetic prices due to the transfer of plants to private hands was reduced to minor importance by the prospect of inadequate stocks. Yet, in the past, the market has recovered from even gloomier webs of circumstance, and what next month's situation will be is anybody's guess.

Returning to statistics for the period under consideration, in futures trading, near-March stocks were at 33.06¢ on January 17, climbed with variations to the record level of 38.05¢ on February 11, then declined to 35.20¢ by the 15th. Sales during the second half of January were 17,430 tons, bringing the monthly total to 30,710 tons. Sales during the first half of February amounted to 14,320 tons.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

Futures	Dec. 25	Jan. 22	Jan. 29	Feb. 5	Feb. 12
1955					
Mar.	31.10	34.75	36.10	36.45	38.05
May	30.58	34.35	35.50	35.55	37.00
July	30.40	34.05	35.10	35.05	35.95
Sept.	30.30	33.85	34.75	34.60	35.45
Dec.	30.15	33.40	34.40	34.10	34.90
1956					
Mar.	30.05	32.90	34.05	33.65	34.30
Total weekly sales, tons	6,380	7,460	8,940	5,120	6,360

On the physical market, R.S.S. #1 began the period at 33.25¢ a pound, rose to 36.50¢ on January 26, slipped to 35.75¢ on February 1, then sped to the high of 38¢ by February 11, falling away thereafter. January monthly average spot prices for certain grades follow: R.S.S. #1, 34.12¢; R.S.S. #3, 33.87¢; #3 Amber Blankets, 32.94¢; and Flat Bark, 30.30¢.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	Dec. 25	Jan. 22	Jan. 29	Feb. 5	Feb. 12
R.S.S.: #1	31.38	35.13	36.00	36.38	38.00
2	31.25	35.00	35.88	36.25	37.88
3	31.13	34.88	35.75	36.13	36.75
Latex Crepe					
#1 Thick	34.75	38.00	38.13	37.88	39.50
Thin	33.88	37.50	37.75	37.63	39.25
#3 Amber Blankets	30.25	34.00	34.38	34.75	36.38
Thin Brown Crepe	29.75	33.50	33.88	34.25	36.13
Flat Bark	27.00	31.25	30.88	31.75	33.63

Latex

The *Hevea* latex market continued strong during the period from January 16 to February 15, with demand outstripping supply and stocks precariously low. It is expected that January will be the month of greatest consumption on record, surpassing the more than 8,000-ton months of November and December. Eastern production was not at a maximum, and it is generally believed that domestic demands will be adequately met, particularly since automotive production will decline during the second quarter of the year. The possibility of spring strikes in the automotive industry, which both management and labor are anxious to avoid, also may curtail future demands. The situation will also pivot on political developments abroad, and the price of natural and synthetic rubbers. Considering the wild oscillations of the natural rubber market, the latex market was fairly stable during the January 16-February 15 period, with spot levels at about 45¢.

Final November and preliminary December domestic statistics for natural and synthetic rubber latices follow:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
November	0	6,335	7,622	9,759
December	0	——	8,010	10,158
GR-S				
November	5,035	80	4,411	4,943
December	5,187	51	4,586	5,354
Neoprene				
November	717	0	631	1,055
December	729	0	515	1,110
Nitrile				
November	558	0	411	939
December	624	0	430	818

Scrap Rubber

Trading was moderate during the period from January 16 to February 15, with the major portion of activity limited to Butyl tubes. Demand for these tubes was particularly heavy during the first half of the period, putting these items in relative short supply and compelling suppliers to boost prices. Toward the middle of February, demand petered out; major consumers had met their requirements and withdrawn from the market, but the slackened call did not affect the new prices.

Mixed auto tubes rose ¼¢ a pound at both eastern and midwestern points during the period, and Butyl tubes were ¾¢ higher.

Current dealers' buying prices for scrap rubber grades, in carload lots delivered to mills at the points indicated, follow:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$11.00	$11.50
S. A. G. auto tires	Nom.	13.00
Truck tires	Nom.	14.00
Peelings, No. 1	40.00/41.00	40.00/42.00
2	Nom.	Nom.
3	15.50	Nom.
Tire buffing	17.00	15.00/16.00
	(¢ per Lb.)	
Auto tubes, mixed	4.00	4.00
Black	5.00	5.00
Red	7.50	7.50
Butyl	5.75	5.75

Reclaimed Rubber

The reclaimed rubber market continued vigorous during the period from January 16 to February 15 as automotive production maintained its high level. Demand for Butyl reclaim stumbled somewhat, however, owing to both the foreseeable slackening in the automotive industry and the sudden drop in natural rubber prices caused by rumors that the General Services Administration would replace low-grade rubber stocks in its defense stockpile with higher grades, rumors which proved correct.

Reclaimers differ on their long-range appraisal of business volume. Some are cautiously optimistic, seeking no permanent threat in the GSA ruling or the seasonal automobile slump. Others are apprehensive, pointing out that despite the record highs of automotive production, the consumption ratio of reclaim to total natural and synthetic rubber during 1954 was one percentage point below that for the previous year and nearly 2½ percentage points below the ratio for 1949, a period of low rubber prices. At any rate, it is generally agreed that the immediate prospect is still good, at least for February and March.

Final November and preliminary December statistics on the domestic industry have been released by the United States Department of Commerce. November figures, in long tons, were: production, 22,915; imports, 0; consumption, 22,321; exports, 862; and month-end stocks, 29,451. Preliminary December figures were: production, 25,568; imports, 61; consumption, 24,275; exports, 835; and month-end stocks, 31,199.

The price of Butyl reclaim rose temporarily to 16¢ a pound from last month's 15½¢ figure, but fell shortly after to 15¢, a more competitive price in view of the changed market situation. Other prices were unaltered.

RECLAIMED RUBBER PRICES

	Lb.
Whole tire: first line	$0.10
Fourth line	.0875
Inner tube: black	.15
Red	.21
Butyl	.15
Pure gum, light colored	.23
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Cotton Fabrics

Trading on the industrial fabric market was reasonably heavy during the period from January 16 to February 15, maintaining the generally strong position that first was noted a month ago. Buying continued on such items as wide drills, cotton ducks, and other fabrics, and the delivery situation of many mills became tighter. Wide drills continued to lead the advance, particularly with sales on the 59-inch, 1.85 yard, 2.25 yard, and other constructions, depleting these stocks to such an extent that further deliveries were not expected to be made until the end of April or the middle of May.

Many rubber companies did a moderate amount of buying of hose and belting ducks and chafer fabrics, with delivery slated for April and May. It was evident that rubber and tire manufacturers were covering further ahead on these goods because of the stability shown by prices and the anticipation that any price change would be upward.

Exception to the general trend was chafer fabrics, the demand for which continues to shrink because of the increasing emergence of the tubeless tire. Chafer linings are used in the tubed tire, and some sources seriously expect the virtual elimination of this fabric from the general market as the tubeless tire overtakes and subsequently outdistances production of the tubed variety. Prices of chafer fabrics continue to fall.

Cotton Fabrics

Drills			
59-inch 1.85 yd.	*yd.*	$0.37	$0.375
2.25-yd.		.31 /	.315
Osnaburgs			
40-inch 2.11-yd.	*yd.*	.2450	
3.65-yd		.155	
Raincoat Fabrics			
Printcloth, 38½-inch, 64x60, 5.35-yd.	*yd.*	.1425/	.145
6.25 yd.		.12	
Sheeting, 48-inch, 4.17-yd.		.20	
52-inch, 3.85-yd.		.215	.22
Ducks			
38-inch 1.78-yd. S.F.	*yd.*	nom.	
2.00-yd. D.F.		nom.	
51.5-inch, 1.35-yd. S.F.		nom.	
Hose and belting		.67	
Chafer Fabrics			
14.40-oz/sq. yd. Pl.	*yd.*	.70	
11.65-oz./sq. yd. S.		.61	
10.80-oz./sq. yd. S		.6575	
8.9-oz./sq. yd. S.		.67	
Other Fabrics			
Headlining, 59-inch, 1.65-yd., 2-ply	*yd.*	.465	
64-inch, 1.24-yd., 2-ply		.595	
Sateens, 53-inch, 1.32-yd.		.54	
58-inch, 1.21-yd.		.59	

Rayon

Rayon statistics for 1954, issued by the Textile Economics Bureau, Inc., reveal that total rayon and acetate production amounted to 1,085,700,000 pounds, a decrease of 9% from the 1953 figure of 1,196,900,000 pounds. All branches of the industry showed declines in production during 1954 except rayon staple plus tow, which increased 42%. The declines were as follows: high-tenacity rayon yarn, with 339,100,000 pounds, 25½%; regular plus intermediate tenacity rayon yarn, with 169,800,000 pounds, 16½%; and acetate yarn, with 197,900,000 pounds, 13½%.

Quarterly production of rayon high-tenacity yarn, in pounds, was 95,300,000; 81,400,000; 68,200,000; and 94,200,000, with an average of 84,800,000 per quarter. The average denier was 1,550, compared to 1,569 for 1953.

Total rayon and acetate shipped in 1954 came to 1,107,900,000 pounds, 5% below the 1,168,700,000 pounds shipped in 1953 and 12½% below the all-time record of 1,268,600,000 pounds sold in 1950. Total viscose rayon shipped for tires and related uses amounted to 333,700,000 pounds, off 24% from the 1953 total of 439,800,000 pounds. Quarterly figures were 90,800,000, 80,600,000; 69,600,000; and 92,700,000. The average denier of such shipments was 1,598, compared to 1,587 in 1953.

RAYON PRICES

Tire Yarns		
High Tenacity		
1100 /480	$0.62 /	$0.63
1100/ 490	.62	
1150/ 490	.62	
1165/ 490	.63	
1230/ 490	.62	
1650/ 720	.61	
1650/ 980	.61	
1875/ 980	.61	
2200/ 960	.60	
2200/ 980	.60	
2200/1466	.67	
4400/2934	.63	
Super High Tenacity		
1650/ 720	.64	
1900/ 720	.64	
Tire Fabrics		
1100/490/2	.72	
1650/980/2	.695 /	.73
2200/980/2	.685	

FFC Memo: X-769

In response to requests for a non-staining FEF black masterbatch to replace the slightly staining GR-S 1104, the number X-769 has been assigned to such a masterbatch, according to S. D. Morgan, chief, sales division, Office of Synthetic Rubber, Federal Facilities Corp., Washington 25, D. C.

X-769 is the equivalent of GR-S 1104, except that the base polymer is a fatty acid emulsified cold rubber and contains a non-staining instead of a slightly staining antioxidant. X-769 is described as follows: 50 parts fast extrusion furnace black plus 100 parts low-temperature polymerized base polymer—approximately 23.5% bound styrene, fatty acid soap emulsified, sugar-free iron activated, carbamate short-stopped, non-staining stabilizer Polygard or equivalent, salt-acid coagulated. Mean Mooney of masterbatch (compounded) is approximately 47 ML-4 at 212° F.

Evaluations of pilot-plant samples indicate that X-769 has a higher tensile strength and better flex life and resilience and extrudes at a faster rate than GR-S 1104. Breakdown and mixing characteristics are comparable to those of GR-S 1104. X-769 is expected to be of special interest in molded and extruded mechanical goods and calendered sheet applications and should be evaluated as a replacement for GR-S 1104 in these applications. After a six-month evaluation period, if consumers' findings are favorable, FFC will abolish GR-S 1104 and assign a permanent number to X-769. If the evaluations are unfavorable, X-769 will be abolished.

Purchase price is 18¢ per pound plus the applicable uniform freight charge. The material was produced in late February on the basis of orders received before February 23.

COMPOUNDING INGREDIENTS*

Abrasives

Pumicestone, powdered	lb.	$0.025 /	$0.045
Rottenstone, domestic	lb.	.03 /	.04
Shelblast	ton	80.00 /	165.00

Accelerators

A-1 (Thiocarbanilide)	lb.	.50 /	.57
A-32	lb.	.66 /	.80
A-100	lb.	.52 /	.66
Accelerator 49	lb.	.53 /	.54
108	lb.	.89	
552	lb.	2.25	
808	lb.	.66 /	.68
833	lb.	1.17 /	1.19
Altax	lb.	.48 /	.50
Arazate	lb.	2.25	
Beutene	lb.	.66 /	.71
Bismate	lb.	3.00	
B-J-F	lb.	.27 /	.32
Butasan	lb.	1.04	
Butazate	lb.	1.04	
Butyl Accelerator 21	lb.	.89	
Eight	lb.	1.10 /	1.35
Zimate	lb.	1.04	
Captax	lb.	.38 /	.40
C-P-B	lb.	1.95	
Cumate	lb.	1.45	
Diesterex N	lb.	.50 /	.57
DOTG (diorthotolylguanidine)			
Cyanamid	lb.	.57 /	.58
Du Pont	lb.	.57 /	.58
DPG (diphenylguanidine)			
Cyanamid	lb.	.48 /	.49
Monsanto	lb.	.48 /	.55
El-Sixty	lb.	.50 /	.57
Ethasan	lb.	1.04	
Ethazate	lb.	1.04	
50-D	lb.	.85	
Ethyl Thiurad	lb.	1.04	
Tuads	lb.	1.04	
Tuex	lb.	1.04	
Zimate	lb.	1.04	
Ethylac	lb.	.93 /	.95
Hepteen	lb.	.44 /	.50
Base	lb.	1.85	
Ledate	lb.	1.04	
MBT (2-mercaptobenzo-thiazole)			
American Cyanamid	lb.	.38 /	.40
Du Pont	lb.	.38 /	.40
Naugatuck	lb.	.38 /	.43
-XXX, Cyanamid	lb.	.49 /	.51
MBTS (mercaptobenzothiazyl disulfide)			
Cyanamid	lb.	.48 /	.50
Du Pont	lb.	.48 /	.50
Naugatuck	lb.	.48 /	.53
-W Cyanamid	lb.	.53 /	.55
Mertax	lb.	.49 /	.56
Methasan	lb.	1.04	
Methazate	lb.	1.04	
Methyl Tuads	lb.	1.14	
Zimate	lb.	1.04	
Monex	lb.	1.14	
Mono-Thiurad	lb.	1.14	
Morfex	lb.	.65 /	.70
MT	lb.	1.00	
NOBS No. 1	lb.	.69 /	.71
Special	lb.	.74 /	.76
O-X-A-F	lb.	.49 /	.54
Pentex	lb.	1.04	
Flour	lb.	.21	
Permalux	lb.	2.17	
Phenex	lb.	.52 /	.59
Pip-Pip	lb.	2.07	
R-2 Crystals	lb.	4.35	
Rotax	lb.	.49 /	.51
RZ-50, -50B	lb.	1.00	
S. A. 52	lb.	1.14	
57, 62, 67, 77	lb.	1.04	
66	lb.	2.50	
Santocure	lb.	.69 /	.76
Selenacs	lb.	2.60	
SPDX-GH	lb.	.69 /	.74
GL	lb.	1.20 /	1.34
Tellurac	lb.	1.21	
Tepidone	lb.	.45	
Tetrone A	lb.	1.91	
Thiofide	lb.	.48 /	.55
S	lb.	.50 /	.57
Thionex	lb.	1.14	
Thiotax	lb.	.38 /	.45
Thiurad	lb.	1.14	
Thiuram E	lb.	1.04	
M	lb.	1.14	
Trimene	lb.	.56 /	.62
Base	lb.	1.03 /	1.10
Tuex	lb.	1.14	
Ultex	lb.	1.00 /	1.10
Unads	lb.	1.14	
Ureka Base	lb.	.66 /	.73
Vulcacure NB	lb.	.45	
ZB, ZE, ZM	lb.	.85	
Z-B-X	lb.	2.45 /	
Zenite	lb.	.48 /	.50
A	lb.	.49 /	.51
Special	lb.	.49 /	.51
Zetax	lb.	.49 /	.51
Zimate	lb.	1.04	

* Prices, in general, are f.o.b. works. Range indicates grade or quantity variations. No guarantee of these prices is made. Spot prices should be obtained from individual suppliers.

† For trade names, see Color—White, Zinc Oxides.

THIS listing of "Compounding Ingredients" has been largely expanded from previous listings in RUBBER WORLD and closely follows the classification of chemicals as found in our book, "Compounding Ingredients for Rubber." Readers are referred to this source for identification of brand names.

Government synthetic rubbers are now included in this list as well as privately produced synthetic rubbers. Suppliers using an abbreviated chemical name for their product are grouped under the abbreviated designation; while product names not using the abbreviation are listed alphabetically; for example, du Pont's MBT is under the MBT group of accelerators; whereas Vanderbilt's Captax (another 2-mercaptobenzothiazole) can be found under the C's. All latex compounding ingredients are grouped under that classification, with some sub-classification according to the physical state of the products, that is, dispersions and emulsions.

Suppliers are requested to submit product additions and price changes promptly as they occur in order that we may make the listing of maximum service to our readers. Comments on the present listing and classifications are invited with a view toward facilitating location of specific items. EDITOR

Accelerator-Activators, Inorganic

Lime hydrated	ton	$10.00 /	$17.50
Litharge, comml.	lb.	.165 /	.17
Eagle, sublimed	lb.	.171	
National Lead, sublimed	lb.	.17 /	.18
Red lead, comml.	lb.	.175 /	.1925
Eagle	lb.	.18	
National Lead	lb.	.18 /	.1925
White lead, carbonate	lb.	.165 /	.175
Eagle	lb.	.165 /	.175
National Lead	lb.	.175 /	.185
White lead, silicate	lb.	.16 /	.1925
Eagle	lb.	.175 /	.1925
National Lead	lb.	.16 /	.18
Zinc oxide, comml.†	lb.	.135 /	.1775

Accelerator-Activators, Organic

Aktone	lb.	.22 /	.23
Barak	lb.	.62	
Capital 170	lb.	.235 /	.27
171	lb.	.1325 /	.1675
700, 701	lb.	.16 /	.195
705, 710	lb.	.16 /	.195
800	lb.	.125 /	.1425
801	lb.	.1425 /	.16
802	lb.	.1475 /	.165
803	lb.	.17 /	.1875
Curade	lb.	.57 /	.59
D-B-A	lb.	1.95	
Emery 600	lb.	.1325 /	.1675
Groco 30	lb.	.1325 /	.1675
35	lb.	.1375 /	.1725
Guantal	lb.	.57 /	.64
Hyfac 400	lb.	.1175 /	.1425
430	lb.	.155 /	.18
431	lb.	.1775 /	.2025
Hystrene S-97	lb.	.1875 /	.21
T-45	lb.	.165 /	.1875
T-70	lb.	.175 /	.1975
Industrene B	lb.	.1275 /	.15
R	lb.	.12 /	.1425
158	lb.	.1325 /	.155
254	lb.	.1425 /	.165
262	lb.	.1525 /	.175
Laurex	lb.	.33 /	.37
MODX	lb.	.295 /	.345
NA-22	lb.	1.50	
Oleic acid, comml.	lb.	.16 /	.195
Emersol 210 Elaine	lb.	.16 /	.195
Groco 2, 4, 8, 18	lb.	.16 /	.195
Plastone	lb.	$0.27 /	$0.30
Polyac	lb.	1.65	
Ridacto	lb.	.25 /	.26
Seedine	lb.	.1485 /	.1703
Stearex Beads	lb.	.1488 /	.1588
Stearic acid			
Emersol 120	lb.	.14 /	.165
130	lb.	.1625 /	.1875
Hydrofol 51	lb.	.09	
Hydrogenated, rubber grade			
Groco	lb.	.125 /	.1425
Rufat 75	lb.	.1175 /	.1425
Single pressed, comml.	lb.	.1425 /	.1575
Emersol 110	lb.	.135 /	.16
Groco 53	lb.	.1425 /	.16
Wilmar 253	lb.	.135 /	.16
Double pressed, comml.	lb.	.1475 /	.165
Groco 54	lb.	.1475 /	.165
Wilmar 254	lb	.14 /	.165
Triple pressed, comml.	lb.	.17 /	.185
Groco 55	lb.	.17 /	.1875
Wilmar 255	lb.	.1625 /	.1875
Sterene 60-R	lb.	.09 /	.1075
Tonox	lb.	.515 /	.605
Vulklor	lb.	.75 /	.95
Wilmar 110	lb.	.16 /	.195
434	lb.	.1325 /	.1675
Zinc stearate, comml.	lb.	.37 /	.42

Antioxidants

AgeBest A26	lb.	.18 /	.24
620-32B	lb.	.20 /	.26
716-30	lb.	.18 /	.24
1041-21	lb.	.165 /	.225
1293-22A	lb.	1.90 /	2.00
AgeRite Alba	lb.	2.35 /	2.45
Gel	lb.	.64 /	.66
H. P.	lb.	.72 /	.74
Hipar	lb.	.98 /	1.00
Powder	lb.	.52 /	.54
Resin	lb.	.75 /	.77
D	lb.	.52 /	.54
Spar	lb.	.52 /	.54
Stalite	lb.	.52 /	.54
S	lb.	.52 /	.54
White	lb.	1.45 /	1.55
Akroflex C	lb.	.77 /	.79
CD	lb.	.72 /	.74
Albasan	lb.	.69 /	.73
Allied AA-1144	lb.	.23 /	.24
AA-1177	lb.	.155 /	.165
Aminox	lb.	.52 /	.57
Antioxidant 2246	lb.	1.55 /	1.58
Antisol	lb.	.23 /	.24
Antisun	lb.	.15 /	.175
Antox	lb.	.52 /	.54
Aranox	lb.	3.25	
Betanox Special	lb.	.80 /	.85
B-L-E, -25	lb.	.52 /	.57
Burgess Antisun Wax	lb.	.185	
B-X-A	lb.	.52 /	.57
Copper Inhibiter X-872-L	lb.	2.01	
D-B-P-C	lb.	.91 /	1.16
Flectol H	lb.	.52 /	.59
Flexamine	lb.	.72 /	.77
Heliozone	lb.	.26 /	.27
Ionol	lb.	.91 /	1.40
NBC	lb.	1.55	
Neozone A	lb.	.56 /	.58
D	lb.	.52 /	.54
Octamine	lb.	.52 /	.57
PDA-10	lb.	.46 /	.48
Perflectol	lb.	.61 /	.68
Polygard	lb.	.52 /	.57
Protector	lb.	.26 /	.31
Rio Resin	lb.	.60 /	.62
Santoflex 35	lb.	.72 /	.79
AW	lb.	.78 /	.85
B	lb.	.52 /	.59
BX	lb.	.63 /	.70
Santovar A	lb.	1.50 /	1.57
Santowhite Crystals, Powder	lb.	1.60 /	1.67
L	lb.	.52 /	.59
MK	lb.	1.29 /	1.36
Sharples Wax	lb.	.23 /	.28
Stabilite	lb.	.55 /	.59
Alba	lb.	.72 /	.79
L	lb.	.60 /	.64
White	lb.	.52 /	.60
Powder	lb.	.41 /	.47
Styphen I	lb.	.51 /	.55
Sunolite #100	lb.	.21 /	.23
#127	lb.	.17 /	.19
Sunproof -713	lb.	.25 /	.30
Improved	lb.	.25 /	.30
Jr.	lb.	.20 /	.25
Thermoflex A	lb.	.98 /	1.00
Tonox	lb.	.52 /	.57
Tysonite	lb.	.24 /	.2475
Velvapex 51-250	lb.	.40	
V-G-B	lb.	.70 /	.75
Wing-Stay S	lb.	.52 /	.61
Zenite	lb.	.48 /	.50

Antiseptics

Copper naphthenate, 6-8%	lb.	.235	
Pentachlorophenol	lb.	.21 /	.29
Resorcinol, technical	lb.	.775 /	.785
Zinc naphthenate, 8-10%	lb.	.245 /	.30

Blowing Agents

Ammonium bicarbonate	lb.	.065 /	.085
Carbonate	lb.	.23 /	.24
Blowing Agent CP-975	lb.	.35	

Celogen	lb.	$1.95	
50-C	lb.	1.01 /	$1.07
Sodium bicarbonate	100 lbs.	2.70 /	3.30
Carbonate, tech	100 lbs.	1.35 /	5.52
Sponge Paste	lb.	.20	
Unicel	lb.	.90	
ND	lb.	.76	
S	lb.	.20	

Bonding Agents

Braze	gal.	6.00 /	9.00
Cover cement	gal.	2.50 /	4.00
Flocking Adhesive RFA17, RFA22, RFA25	lb.	.50	
G-E Silicone Paste SS-15	lb.	4.52 /	5.10
SS-64	lb.	3.65 /	6.75
-67 Primer	lb.	7.50 /	12.50
Gen-Tac Latex	lb.	.75 /	.855
Kalabond Adhesive	gal.	6.50 /	16.00
Tie Cement	gal.	2.00 /	5.60
MDI	lb.	4.00 /	6.00
-50	lb.	2.00 /	3.00
Thixons	gal.	1.48 /	12.00
Ty Ply BN, Q, S, UP, 3640	gal.	6.75 /	8.00
RC	gal.	3.75 /	5.00

Brake Lining Saturants

BRT 3	lb.	.018 /	.0265
Resinex L-S	lb.	.0225/	.03

Carbon Blacks‡

Conductive Channel—CC

Continental R-40	lb.	.23 /	.30
Kosmos/Dixie BB	lb.	.23 /	.30
Spheron C	lb.	.14 /	.185
Voltex	lb.	.18 /	.315

Easy Processing Channel—EPC

Continental AA	lb.	.074 /	.1225
Kosmobile 77/Dixiedensed 77	lb.	.074 /	.1225
Micronex W-6	lb.	.074 /	.1225
Spheron #9	lb.	.074 /	.1225
Texas E	lb.	.074 /	.1225
Witco #12	lb.	.074 /	.1225
Wyex	lb.	.074 /	.12

Hard Processing Channel—HPC

Continental F	lb.	.074 /	.1225
HX	lb.	.074 /	.12
Kosmobile S/Dixiedensed S	lb.	.074 /	.1225
Micronex Mk. II	lb.	.074 /	.1225
Spheron #4	lb.	.074 /	.1225
Witco #6	lb.	.074 /	.1225

Medium Processing Channel—MPC

Arrow TX	lb.	.074 /	.12
Continental A	lb.	.074 /	.1225
Kosmobile S-66/Dixiedensed S-66	lb.	.074 /	.1225
Micronex Standard	lb.	.074 /	.1225
Spheron #6	lb.	.074 /	.1225
Texas 109	lb.	.079 /	.1275
Texas M	lb.	.074 /	.1225
Witco #1	lb.	.074 /	.1225

Conductive Furnace—CF

Aromex 115	lb.	.089 /	.129
Vulcan C	lb.	.105 /	.15
SC	lb.	.18 /	.223

Fast Extruding Furnace—FEF

Arovel	lb.	.06 /	.10
Continex FEF	lb.	.06 /	.10
Kosmos 50/Dixie 50	lb.	.06 /	.10
Statex M	lb.	.06 /	.10
Sterling SO	lb.	.06 /	.10

Fine Furnace—FF

Statex B	lb.	.065 /	.105
Sterling 99	lb.	.065 /	.105

High Abrasion Furnace—HAF

Aromex	lb.	.079 /	.119
Continex HAF	lb.	.079 /	.125
Kosmos 60/Dixie 60	lb.	.079 /	.1175
Philblack O	lb.	.079 /	.119
Statex R	lb.	.079 /	.125
Vulcan #3	lb.	.079 /	.125

Intermediate Super Abrasion Furnace—ISAF

Aromex 125	lb.	.10 /	.14
Kosmos 70/Dixie 70	lb.	.10 /	.145
Philblack I	lb.	.10 /	.145
Statex 125	lb.	.10 /	.145
Vulcan 6	lb.	.10 /	.145

Medium Abrasion Furnace—MAF

Philblack A	lb.	.06 /	.10

Super Abrasion Furnace—SAF

Philblack E	lb.	.125 /	.165
Vulcan 9	lb.	.125 /	.168

General-Purpose Furnace—GPF

Sterling V	lb.	.05 /	.09
V Non-staining	lb.	.05 /	.09

‡ At the request of the suppliers, the lowest prices shown for carbon blacks are for carloads in bags. Prices for hopper carloads are lower.

High Modulus Furnace—HMF

Continex HMF	lb.	$0.055 /	$0.095
Kosmos 40/Dixie 40	lb.	.055 /	.095
Modulex	lb.	.055 /	.095
Statex 93	lb.	.055 /	.095
930	lb.	.047 /	.087
Sterling L, LL	lb.	.055 /	.095

Semi-Reinforcing Furnace—SRF

Continex SRF	lb.	.045 /	.085
Essex	lb.	.045 /	.085
Furnex	lb.	.045 /	.085
Gastex	lb.	.05 /	.09
Kosmos 20/Dixie 20	lb.	.045 /	.085
Pelletex, NS	lb.	.045 /	.085
Sterling NS, S	lb.	.045 /	.085
R	lb.	.05 /	.09

Fine Thermal—FT

P-33	lb.	.055	
Sterling FT	lb.	.055	

Medium Thermal—MT

Sterling MT	lb.	.04	
Non-staining	lb.	.05	
Thermax	lb.	.035	
Stainless	lb.	.045	

Colors

Black

Iron oxides, comml	lb.	.1275/	.13
BK—Lansco	lb.	.1275/	.13
Williams	lb.	.1275/	.13
Lansco synthetic	lb.	.10	
Mapico	lb.	.1275/	.13
Lampblack, comml	lb.	.16 /	.45
Superjet	lb.	.0825/	.1175
Permanent Blue	lb.	.80 /	1.05
Stan-Tone	lb.	.45 /	1.20
Vansul masterbatch	lb.	.60 /	.65
Paste	lb.	.14 /	.15

Blue

Du Pont	lb.	1.77 /	4.55
Filo	lb.	.28	
Heveatex pastes	lb.	.80 /	1.45
Lansco ultramarines	lb.	.25 /	.28
Monsanto Blue 7	lb.	1.55	
11	lb.	3.45	
DPB-283	lb.	1.93	
S-11	lb.	2.05	
Permanent Blue	lb.	.80 /	1.05
Stan-Tone	lb.	1.55 /	1.60
Vansul masterbatch	lb.	.90 /	2.70

Brown

Filo	lb.	.13	
Iron oxides, comml	lb.	.1375/	.14
Lansco synthetic	lb.	.125	
Mapico Brown	lb.	.1375/	.14
Brown 422	lb.	.14	
Sienna, burnt, comml	lb.	.0425/	.155
Williams	lb.	.11 /	.1725
Raw, comml	lb.	.045 /	.1325
Williams	lb.	.08 /	.1725
Umber, burnt, comml	lb.	.06 /	.07
Williams	lb.	.0675/	.08
Raw, comml	lb.	.0625/	.07
Williams	lb.	.07 /	.0825
Williams			
Pure brown	lb.	.1375/	.14
Vandyke	lb.	.12	
Mapico Tan 20	lb.	.2025/	.205
Tan 15	lb.	.205	
Metallic brown	lb.	04 /	.05
Vansul masterbatch	lb.	2.10 /	2.20

Green

Chrome	lb.	.19 /	.50
Chrome oxide	lb.	.3925/	1.10
G-4099, -6099	lb.	.3925/	.3975
GH-9869	lb.	1.00 /	1.15
9976	lb.	1.10 /	1.25
Green	lb.	.80 /	2.40
Du Pont	lb.	1.97 /	2.80
Filo	lb.	.40	
Heveatex pastes	lb.	.95 /	1.85
Lansco Toner	lb.	1.35	
Monsanto Green 3	lb.	2.75	
14	lb.	1.45	
17	lb.	3.95	
71205	lb.	1.35	
DGP	lb.	2.03	
S-17	lb.	2.25	
Stan-Tone	lb.	1.75 /	4.60
Vansul masterbatch	lb.	2.00 /	2.60

Orange

Du Pont	lb.	2.75	
Monsanto Orange 68187	lb.	2.90	
Stan-Tone	lb.	.70 /	3.35
Vansul masterbatch	lb.	2.00 /	2.60

Red

Antimony trisulfide	lb.	.27 /	.30
R. M. P. No. 3	lb.	.72	
Sulfur Free	lb.	.78	
Cadmium red lithopone	lb.	1.64 /	2.05
Cadmolith	lb.	1.72 /	2.20
Du Pont	lb.	1.47 /	1.80
Filo	lb.	.11	
Indian Red	lb.	.1275	
Iron oxide, comml	lb.	$0.06 /	$0.13
Lansco synthetic	lb.	.1175	
Mapico	lb.	.1275/	.13
Recco	lb.	.12	
Williams Red	lb.	.1275/	.15
Monsanto Red 7	lb.	1.55	
41	lb.	4.40	
3501	lb.	1.15	
4004	lb.	1.50	
69191	lb.	3.38	
Autumn	lb.	1.10	
PRP-285	lb.	1.27	
S-44	lb.	1.28	
Maroon 113	lb.	1.50	
61148	lb.	1.75	
Rub-Er-Red	lb.	.0975	
Stan-Tone	lb.	1.05 /	4.05
Tuscan	lb.	.15 /	.46
Vansul masterbatch	lb.	.95 /	3.30
Venetian	lb.	.035 /	.0625

White

Antimony oxide	lb.	.29 /	.305
Burgess Iceberg	ton	50.00 /	80.00
Cryptone BT	lb.	.10 /	.11
Permolith	lb.	.075 /	.085
Titanium pigments			
Rayox LW	lb.	.195 /	.205
R-110	lb.	.215 /	.225
Ti-Cal	lb.	.075 /	.0825
Ti-Pure	lb.	.195 /	.225
Titanox A, AA, A-168	lb.	.21 /	.22
C-50	lb.	.1225/	.1275
RA, -10, -50	lb.	.23 /	.24
RC	lb.	.0825/	.0875
-HT, -HTX	lb.	.08 /	.085
Zopaque Anatase	lb.	.225 /	.235
Rutile	lb.	.245 /	.255
Zinc oxide, comml	lb.	.135 /	.1775
Azo ZZZ-11, -44, -55	lb.	.135 /	.155
20% leaded	lb.	.1395/	.1595
35% leaded	lb.	.1425/	.1625
50% leaded	lb.	.14625/	.16625
Eagle AAA, lead free	lb.	.135 /	.145
5% leaded	lb.	.135 /	.145
35% leaded	lb.	.1425/	.1525
50% leaded	lb.	.14625/	.15625
Florence Green Seal	lb.	.1525/	.1625
Red Seal	lb.	.1475/	.1575
White Seal	lb.	.1575/	.1675
Horsehead XX-4, -78	lb.	.135 /	.145
Kadox -15, -17, -22	lb.	.135 /	.145
-25	lb.	.1575/	.1675
Lehigh, 35% leaded	lb.	.14 /	.15
50% leaded	lb.	.14⅛/	.15⅛
Protox-166, -167	lb.	.135 /	.145
St. Joe, lead free	lb.	.135 /	.145
Zinc sulfide, comml	lb.	.253 /	.263
Cryptone ZS	lb.	.253 /	.263

Yellow

Cadmium yellow lithopone	lb.	1.15	
Cadmolith	lb.	1.12 /	1.20
Du Pont	lb.	1.80 /	2.15
Filo	lb.	.10	
Iron oxide, comml	lb.	.0525/	.1075
Lansco synthetic	lb.	.1075	
Mapico	lb.	.105 /	.1075
Williams	lb.	.105 /	.1075
Monsanto Yellow 14	lb.	1.91	
10010	lb.	1.91	
BYP-282	lb.	1.21	
GA	lb.	2.45	
S-10010	lb.	1.17	
Stan-Tone	lb.	1.00 /	1.55
Vansul masterbatch	lb.	.95 /	1.95
Williams Ocher	lb.	.0525/	.055

Dusting Agents

Diatomaceous silica	ton	32.00 /	48.00
Extrud-o-Lube, conc	gal.	1.54 /	1.69
Glycerized Liquid Lubricant, concentrated	gal.	1.48 /	1.63
Latex-Lube GR	lb.	.20	
Pigmented	lb.	.1825	
R-66	lb.	.165	
Liqui-Lube	lb.	.1625	
N. T.	lb.	.1675	
Liquizinc No. 305	lb.	.30 /	.35
Lubrex	lb.	.25 /	.30
Mica Concord	lb.	.075 /	.0825
Mineralite	ton	45.00	
Pyrax A	ton	13.50	
W. A.	ton	16.00	
Talc, comml	ton	14.00 /	38.50
EM	ton	11.00 /	63.00
LS Silver	ton	29.25	
Nytals	ton	25.00 /	36.00
Sierra Sagger 7	ton	34.00	
Sierra white IR	ton	19.75	
III	ton	20.75	
Vanfre	gal.	2.00 /	2.50

Extenders

BRS 700	lb.	.02 /	.0285
BRT 7	lb.	.03 /	.031
Cumar Resins	lb.	.065 /	.17
Dielex B	lb.	.06	
Factice, Amberex	lb.	.29 /	.36
Brown	lb.	.1425/	.268
Neophax	lb.	.157 /	.268
White	lb.	.144 /	.285
G.B. Asphaltenes	lb.	.06 /	.065

Millex, W	lb.	$ .07	
Mineral Rubbers			
Black Diamond	ton	38.00	/ $ 40.00
Hard Hydrocarbon	ton	46.50	/ 48.50
Hydrocarbon MR	ton	45.00	/ 55.00
Parmr	ton	21.00	/ 29.00
T-MR Granulated	ton	47.50	/ 50.00
Nuba No. 1, 2	lb.	.0575	/ .0625
3X	lb.	.0775	/ .0825
OPD-101	lb.	.26	
Rubber substitute, brown	lb.	.122	/ .22
Car-Bel-Ex A	lb.	.14	
Car-Bel-Lite	lb.	.35	
Extender 600	lb.	.1765	
White	lb.	.148	/ .256
Stan-Shells	ton	35.00	/ 73.00
Synthetic 100	lb.	.41	
Vistanex	lb.	.45	/ .475

Fillers, Inert

Agrashell flour	ton	50.00	/ 74.00
Barytes, floated, white	ton	41.60	/ 60.10
Off-color, domestic	ton	25.00	
No. 1	ton	41.35	/ 60.10
2	ton	39.35	/ 58.00
Sparmite	ton	75.00	/ 80.00
Blanc fixe	ton	100.00	/ 165.00
Burgess Iceberg	ton	50.00	/ 80.00
Pigment #20	ton	35.00	/ 60.00
#30	ton	37.00	/ 60.00
HC-75	ton	12.00	/ 30.00
HC-80	ton	14.00	/ 32.00
WP #1	ton	11.00	/ 16.00
Cary #200	ton	30.00	/ 55.00
Citrus seed meal	lb.	.04	
Oil	lb.	.15	
Clays			
Aiken	ton	14.00	
Albacar	ton	50.00	/ 55.00
Aluminum Flake	ton	20.00	/ 60.00
#5	ton	23.50	/ 30.00
Champion	ton	14.00	
Crown	ton	14.00	/ 33.00
Dixie	ton	14.00	
Franklin	ton	13.50	/ 35.25
GK Soft Clay	ton	11.00	
Hi-White R	ton	13.50	
Hydratex R	ton	28.00	
Kaolloid	ton	10.50	
Laminar	ton	30.00	
Paragon	ton	13.50	/ 31.50
McNamee	ton	13.50	
RX-43	ton	33.00	
Recco	ton	14.00	
Sno-Brite	ton	12.50	
Stan-Clay	ton	28.00	
Stellar-R	ton	50.00	
Suprex	ton	14.00	/ 32.00
Swanee	ton	12.50	
Windsor	ton	14.00	/ 30.00
Diatomaceous silica	ton	$32.00	/ $48.00
Flocks			
Cotton, dark	lb.	.095	/ .135
Dyed	lb.	.55	/ .60
White	lb.	.13	/ .33
Fabrifil X-24-G	lb.	.135	
X-24-W	lb.	.235	
Filfloc 6000	lb.	.33	
F-40-900	lb.	.135	
HSC #35 Silicone Emulsion	lb.	1.36	/ 3.50
Kalite	ton	50.00	/ 65.00
Lithopone, comml.	lb.	.075	/ .085
Albalith	lb.	.075	/ .085
Astrolith	lb.	.06¾	/ .0675
Eagle	lb.	.0725	/ .075
Sunolith	lb.	.075	/ .0825
Mica Concord	lb.	.075	/ .0825
Millical	ton	35.00	/ 50.00
Mineralite	ton	40.00	/ 60.00
Non-Fer-Al	ton	30.00	/ 45.00
Purecal	ton	56.75	/ 71.75
Pyrax A	ton	13.50	
W. A.	ton	16.00	
Sawdust	ton	14.00	/ 33.00
Stan-White	ton	8.50	/ 9.45
Super-White Silica	ton	23.00	/ 43.00
Suspenso	ton	33.00	/ 48.00
Ti-Cal	lb.	.0675	
Valron estersil	lb.	1.00	
Whiting, limestone			
Atomite	ton	30.00	
Calcite	ton	21.50	
Keystone	ton	16.00	
Omya	ton	30.00	
Paxinosa	ton	10.00	/ 18.00
Snowflake	ton	17.00	/ 18.00
Stonelite	ton	9.00	
Witco	ton	8.50	
York	ton	9.50	

Finishes

Apex Bright Finish #5200-E	lb.	.25	
Rubber Finish	gal.	2.50	
Black-out	gal.	4.50	/ 8.00
Flocks			
Rayon, colored	lb.	.90	/ 1.50
White	lb.	.75	/ 1.25
Also see Flocks, under Fillers, Inert			
Rubber lacquer, clear	gal.	1.00	/ 2.00
Shellacs, Angelo	lb.	.485	/ .7325
Vac Dry	lb.	.485	/ .57
Talc (*See Talc, under Dusting Agents*)			
Unidip	lb.	.15	/ .20
Wax, Bees	lb.	.61	/ .75
Carnauba	lb	.63	/ 1.07
Montan	lb.	.135	/ .32

No. 118, colors	gal.	$0.86	/ $ 1.41
Neutral	gal.	.76	/ 1.31
Van Wax	gal.	1.45	/ 1.50

Latex Compounding Ingredients

Acintol D, DLR	lb.	.06	/ .075
FA #1	lb.	.065	/ .08
#2	lb.	.075	/ .09
Accelerator 552	lb.	2.25	
J-117, -302	lb.	1.00	/ 1.15
-144	lb.	.15	/ .30
-307	lb.	1.10	/ 1.25
-311	lb.	.60	/ .75
Aerosol, dry types	lb.	.39	/ 1.20
Liquid types	lb.	.40	/ .72
Alcogum AN-6	lb.	.05	
AN-10	lb.	.085	
Alrosol	lb.	.41	
Alrowet D-75	lb.	.63	
Amberex solutions	lb.	.1675	/ .18
Antifoam J-114	lb.	3.25	/ 3.45
P-242	lb.	.24	/ .35
Antioxidant J-137, -140	lb.	.55	/ .70
-139, -293	lb.	1.45	/ 1.60
-182	lb.	2.00	/ 2.15
-186	lb.	1.40	/ 1.55
2246	lb.	1.65	/ 1.68
Anti-Webbing Agent J-183	lb.	.75	/ .90
-297	lb.	.27	/ .40
Aquablak B	lb.	.0925	/ .0975
G	lb.	.105	/ .11
K	lb.	.1075	/ .1125
M	lb.	.085	/ .09
Aquarex D	lb.	.78	
G	lb.	.21	
L, ME	lb.	.94	
MDL	lb.	.33	
NS	lb.	.60	
SMO	lb.	.50	
WAQ	lb.	.23	
Areskap 50	lb.	.30	/ .38
100, dry	lb.	.60	/ .72
Aresket 240	lb.	.30	/ .38
300, dry	lb.	.60	/ .72
Aresklene 375	lb.	.42	/ .57
Ben-A-Gels	lb.	.98	/ 1.40
Bentone 18, 18C	lb.	.45	
34	lb.	.60	
Casein	lb.	.22	
Cellosize WP-09, -3, -300	lb.	1.36	/ 1.60
CW -12	lb.	.85	
37	lb.	.70	
Defoama W-1701	lb.	.125	
Defoamer 115a	lb.	.50	
Dispersing Agents			
Blancol	lb.	.1525	/ .26
N	lb.	.155	/ .26
Darvan Nos. 1, 2, 3	lb.	.22	/ .30
Daxad 11, 21, 23, 27	lb.	.08	/ .30
Dispersaid H7A	lb.	.58	
1159	lb.	.43	
Emulphor ON-870	lb.	.50	/ .70
Igepal CO-630	lb.	.2875	/ .47
Igepon T-73	lb.	.285	/ .495
T-77	lb.	.45	/ .69
Indulins	lb.	.06	/ .08
Kreelons	lb.	.132	/ .155
Laurelton Oil	lb.	.18	
Leonil SA	lb.	.52	/ .65
Lomar PW	lb.	.18	
Marasperse CB	lb.	.1225	/ .1425
N	lb.	.095	/ .105
Modicols	lb.	.17	/ .58
Nekal BA-75	lb.	.395	/ .54
BX-76	lb.	.63	/ .75
Pluronics	lb.	.335	/ .40
Polyfons	lb.	.08	/ .09
Sorapon SF-78	lb.	.28	/ .40
Tergitol NPX	lb.	.275	/ .3074
TMN	lb.	.2875	/ .32
7	lb.	.4125	/ .44
Trenamine	lb.	.15	
Triton R-100	lb.	.12	/ .25
X-100, -102, -114	lb.	.255	/ .36
Dispersions			
AgeRite Alba	lb.	3.00	
Powder, Resin D	lb.	.80	
White	lb.	1.80	
Altax	lb.	.75	
Black No. 25	lb.	.22	
Black Shield Nos. 2, 6	lb.	.08	
3	lb.	.095	
4-35	lb.	.09	
5	lb.	.093	
7-F, 8	lb.	.165	
55	lb.	.18	
Iron oxide, 60%	lb.	.40	
No. 305 Liquizinc	lb.	.30	/ .35
L.S.W.	lb.	1.50	
P-33	lb.	.35	
Rayox	lb.	.45	
Rotax	lb.	.75	
Sulfur	lb.	.12	/ .30
No. 2	lb.	.14	/ .16
Telloy	lb.	3.00	
Tuads, Methyl	lb.	1.60	
Vulcanizing			
C group	lb.	.40	/ 1.30
G group	lb.	.45	/ .90
N group	lb.	.40	/ 1.00
Zetax	lb.	.75	
Zimates, Butyl	lb.	1.30	
Ethyl, Methyl	lb.	1.35	
Zinc oxide	lb.	.40	
Emulsions			
AgeRite Stalite	lb.	$0.75	
Habuco Resin Nos. 502, 515, 523	lb.	.195	/ $0.20
503	lb.	.22	/ .225
504, 526	lb.	.19	/ .195
517	lb.	.175	/ .18
524	lb.	.155	/ .16
Resin A-2	lb.	.16	/ .25
P-370	lb.	.175	/ .25
X-210	lb.	.12	/ .22
Freeze-Stabilizer 322	lb.	.40	
12116C	lb.	.52	
Gelling Agent P-397	lb.	.34	/ .37
Igepon T-43	lb.	.145	/ .35
T-51	lb.	.125	/ .285
-73	lb.	.285	/ .495
Indulins	lb.	.06	/ .08
Ludox	lb.	.1675	/ .1925
Marmix	lb.	.41	/ .48
Merac	lb.	.75	/ 1.05
Micronex, colloidal	lb.	.06	/ .07
Monsanto Blue 4685 WD	lb.	1.60	
Green 4884 WD	lb.	1.80	
Red 127	lb.	1.25	
OPD-101	lb.	.16	/ .26
Pliolite Latex 150, 190	lb.	.32	/ .41
170	lb.	.37	/ .46
Polyvinyl methyl ether	lb.	.25	/ .45
Resin V	lb.	.13	
Roelgel 100C	lb.	.46	
Santomerse D	lb.	.44	/ .65
S	lb.	.13	/ .25
Sellogen Gel	lb.	.1275	
Sequestrene AA	lb.	.905	/ .975
30A	lb.	.245	/ .265
ST	lb.	.585	/ .615
Setsit #5	lb.	.75	/ 1.05
Stablex A	lb.	.80	/ 1.10
B, G	lb.	.50	/ .95
K	lb.	.27	/ .35
P	lb.	.35	/ .50
T	lb.	.14	/ .22
Webnix	lb.	1.50	/ 2.50

Mold Lubricants

Acintol D	lb.	.06	/ .075
Alipal CO-433	lb.	.25	/ .45
CO-436	lb.	.22	/ .41
Aquarex Compounds	lb.	.21	/ .94
Carbowax 200, 300, 400	lb.	.22	/ .25
1500	lb.	.255	/ .2825
4000	lb.	.31	/ .32
6000	lb.	.35	/ .36
Colite Concentrate	gal.	.90	/ 1.15
D-Tak Dip #10	gal.	1.50	
ELA	lb.	.82	
DC Mold Release Fluid	lb.	3.39	/ 4.75
Emulsion Nos. 35, 35A, 35B,36	lb.	1.36	/ 2.50
DC7	lb.	5.13	/ 6.50
8	lb.	1.36	/ 1.80
Glycerized Liquid Lubricant, concentrated	gal.	1.48	/ 1.63
Igepals	lb.	.2875	/ .47
Igepon AP-78	lb.	.44	/ .68
T-43	lb.	.145	/ .35
T-51	lb.	.125	/ .285
T-73	lb.	.285	/ .495
Lubrex	lb.	.25	/ .30
Lubri-Flo	gal.	10.00	/ 12.05
Lustermold	lb.	.41	
Mold Paste	lb.	.25	
Monopole Oil	lb.	.16	
Monten Wax	lb.	.57	
Para Lube	lb.	.046	/ .048
Pluronics	lb.	.335	/ .44
Polyglycol E series	lb.	.29	/ .42
Rubber-Glo	gal.	.94	/ .97
Soap, Hawkeye	lb.	1.35	/ 1.45
Purity	lb.	.155	/ .165
Sodium stearate	lb.	0.40	
Stoner's 700 series	gal.	1.20	/ 1.25
800 series	gal.	1.26	/ 1.70
900 Series	gal.	1.55	/ 2.55
A Series	gal.	1.80	/ 4.50
Ucon 50-HB Series	lb.	.25	/ .375
Ulco	lb.	.12	/ .23
Vanfre	gal.	2.50	/ 3.00

Odorants

Alamasks	lb.	.75	/ 6.50
Coumarin	lb.	2.95	/ 3.55
Curodex 19	lb.	4.75	/ 5.05
188	lb.	5.75	
198	lb.	6.75	
Ethavan	lb.	6.75	/ 7.35
Latex Perfume #7	lb.	4.00	
Neutroleum Gamma	lb.	3.60	
Rubber Perfume #10	lb.	2.60	
Vanillin, Monsanto	lb.	3.00	/ 3.15

Plasticizers and Softeners

Acintol R	lb.	.065	/ .07
Adipol 2EH, 10A	lb.	.435	/ .465
BCA	lb.	.45	/ .475
ODY	lb.	.48	/ .51
Aro Lene #1980	lb.	.10	/ .12
Baker AA Oil	lb.	.195	/ .24
Crystal O Oil	lb.	.21	/ .255
Processed oils	lb.	.215	/ .235
Bardol, 639	lb.	.215	/ .235
B	lb.	.0625	/ .065
Benzoflex 2-45	lb.	.26	/ .29
9-88	lb.	.27	/ .30
Bondogen	lb.	.55	/ .60

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.25 per line (ten words)	Light face type 40c per line (ten words)	Light face type $1.00 per line (ten words)
Bold face type $1.60 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.40 per line (eight words)
Allow nine words for keyed address.		*Letter replies forwarded without charge, but no packages or samples.*

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS OPEN

SILICONE TECHNICAL SALESMAN—FOR SALES AND PRODuct application of silicone in mechanical goods field. Past experience in silicone sales and production methods and facilities required. Address Box No. 1675, care of RUBBER WORLD.

RUBBER CHEMICALS DEVELOPMENT

Opportunities for chemists under 33 with several years' experience in rubber emulsion polymerization or rubber compounding. Work will include development of elastomers and associated chemicals, and evaluation and formulation of latex emulsion paints. Position is essentially in research, but may lead to sales and technical service. Please write giving personal and work history to: Employment Supervisor, Shell Development Company, Emeryville, California.

V-BELT DEVELOPMENT ENGINEER

A large Mechanical Rubber Goods plant located near the Atlantic Coast has an opening in its Research and Development Department for an engineer with experience in the development and manufacture of V-Belts. Reply giving full particulars as to training, experience, salary expected, etc. Our employes know of this advertisement. Please send replies to Post Office Box 1071, Boston, Massachusetts—Attention: Mr. W. T. Dwyer.

RUBBER CHEMIST

Experienced Rubber Chemist for research involving all types of synthetic elastomers. Minimum of 3 years' experience in rubber technology and rubber compounding. New laboratory in San Francisco Bay area. Division of large chemical company. Write giving full particulars regarding age, experience, education, and salary expected. Replies held confidential. Address Box No. 1676, care of RUBBER WORLD.

RUBBER COMPOUNDER WITH AN INTEREST IN MATErials, and having 2 to 3 years' minimum industrial experience plus a B.S. degree, or the equivalent in additional industrial experience, for developmental and technical service work with an active raw materials supplier of long standing. This position does not require travel, but demands a mature individual of initiative who is deeply interested in building a higher place for himself and his organization in the rubber industry. Please send summary of education and experience, expected salary, and photograph. NEVILLE CHEMICAL CO., Pittsburgh 25, Pa.

Exceptional opportunity for rubber chemists having from two to five years' experience in the rubber industry and holding degrees in chemistry or chemical engineering. Development and sales service work with well established Eastern firm. Excellent laboratory facilities. Opportunity for contacts with customers, salesmen and production people.

Your reply will be held confidential. Please give age, experience and education.

Employees know of this ad.

ADDRESS BOX NO. 1625, c/o RUBBER WORLD

UNUSUAL OPPORTUNITY

WELL ESTABLISHED EASTERN FIRM HAS OPENINGS FOR TWO MEN:

Chemist for development work and to assist in production.

Salesman to handle sales and to assist in the development of new items.

The men we desire must be experienced in their own fields.

Give complete résumé in first letter and salary expected.

All replies will be held in strict confidence.

Address Box No. 1666, c/o RUBBER WORLD

SITUATIONS OPEN (Continued)

RUBBER TECHNOLOGIST TECHNICAL SALES SERVICE

Large eastern chemical manufacturer has technical sales service opening in synthetic rubber and rubber chemicals. Age 25 to 35. Several years experience in rubber manufacture. College degree. Foreign languages, preferably German and French, very desirable but not essential. Should be willing to make headquarters in Europe. Excellent opportunity in rapidly expanding field. Write giving in full detail, age, education and experience. Replies held strictly confidential. Our employees know of this ad.

Address Box No. 1683, c/o RUBBER WORLD

RUBBER COMPOUNDER

New Jersey manufacturer of electrical wire and cable desires rubber chemist experienced in natural and synthetic rubber compounding for its modern research laboratories. Salary: open. Address Box No. 1677, care of RUBBER WORLD.

PRODUCT ENGINEER

Eastern rubber manufacturer is expanding V-belt technical staff. Wish to employ additional young graduate engineers with V-belt experience. In reply please cite education, experience, references, and salary requirements. Address Box No. 1681, care of RUBBER WORLD.

LATEX CHEMIST

Required for Development Laboratory of compound supplier. Must have compounding experience in the use of natural and synthetic latices for dipped goods, casting, adhesives, and foam applications. Excellent opportunity for graduate chemist or chemical engineer in a new plant in the Midwest. Good starting salary. Replies held in strict confidence. Address Box No. 1684, care of RUBBER WORLD.

SITUATIONS WANTED

CHEMICAL ENGINEER: RUBBER AND PLASTICS TECHNOLogist with broad experience in natural and synthetic latices, high polymers, dispersions and plastisols involving laboratory, pilot-plant, process development and plant evaluations of current and new products and technical sales. Good educational background in high polymers. Presently employed, desires position with progressive organization. Address Box No. 1667, care of RUBBER WORLD.

PRODUCTION-DEVELOPMENT ENGINEER AVAILABLE. BROAD technical-practical knowledge of mechanical rubbers, sponge products, and plastics. Cost minded, capable on efficiency, processes, projects, compoundings, and specifications. Address Box No. 1668, care of RUBBER WORLD.

DEVELOPMENT ENGINEER & TECHNOLOGIST

Rubber and plastics engineer seeks new connection with progressive, well-established organization. Over 25 years' experience continuously in the chemical and development fields of molding, fabric coating, paper treatment, pressure-sensitives, and product development in rubber, latex, and synthetic resins, including polyesters. Also diversified chemical fields covering laboratory direction, engineering executive and consulting work. B.S. in chemistry, with mechanical design and plant layout experience. Patents registered and outstanding commercial development credits. Desire eastern or N. Y. metropolitan area in rubber, plastics, or allied fields. Address Box No. 1669, care of RUBBER WORLD.

CHEMICAL ENGINEER: EXPERIENCED IN EXTRUDED LATEX Rubber Thread Technology and general latex compounding. Capable and experienced in management, production, and technical fields. Age 40; married; family. Address Box No. 1670, care of RUBBER WORLD.

DEVELOPMENT CHEMIST. 15 YEARS' EXPERIENCE IN ADhesives and coatings; natural and synthetic rubber; vinyls and other plastics. Familiar with all phases of latex compounding. Some experience in mechanicals. Product development and application, compounding, market research. Now manager of small factory. Harvard degree. Age 41. $10,000. Eastern Massachusetts. Address Box No. 1671, care of RUBBER WORLD.

CHIEF CHEMIST OF SMALL MECHANICAL GOODS PLANT; 14 years' large, small plant compounding, processing experience. Would like technical sales opportunity in midwest area. Address Box No. 1672, care of RUBBER WORLD.

TECHNICAL SALESMAN—CHEMICAL ENGINEER AND LATEX Technologist desires to represent an aggressive company in the sales of latices, compounds, dispersions, emulsions, plastisols, and organisols. Complete background in formulation, compounding, fabricating of old and developing of new products. Administrative background would assist in establishing a branch office. Interested in East Coast, South, Midwest, or West Coast. Available soon. Address Box No. 1674, care of RUBBER WORLD.

BRC 20	lb.	$0.15 /	$0.175
22	lb.	.025 /	.0275
30	lb.	.0125 /	.021
521	lb.	.019 /	.02
BRH 2	lb.	.0213 /	.0351
BRS 700	lb.	.02 /	.0285
BRT 7	lb.	.03 /	.031
BRV	lb.	.0475 /	.0565
Bunarex Liquid	lb.	.0425 /	.0555
Resins	lb.	.065 /	.1225
Bunnatol G.S.	lb.	.40 /	.505
Butac	lb.	.125 /	.135
Butyl stearate, comml	lb.	.24 /	.27
Binney & Smith	lb.	.23 /	.26
Hardesty	lb.	.23 /	.26
BxDC	lb.	.40 /	.41
Cabol 100	lb.	.02 /	.06
Califlux 510, 550	lb.	.025 /	.0325
G. P.	lb.	.0125 /	.02
R-100	lb.	.045 /	.0525
TT	lb.	.017 /	.0245
Capryl alcohol, comml	lb.	.165 /	.20
Binney & Smith	lb.	.18 /	.28
Hardesty	lb.	.18 /	.28
Chlorowax 40	lb.	.145 /	.225
70	lb.	.18 /	.24
-S	lb.	.21 /	.27
Contogums	lb.	.0875 /	.111
Cumar Resins	lb.	.065 /	.17
DBM (di butyl-m-cresol)			
Darex	lb.	.32 /	.3475
DBP (di butyl phthalate),			
comml	lb.	.30 /	.33
Darex	lb.	.30 /	.33
Hatco	lb.	.30 /	.33
Monsanto	lb.	.30 /	.33
Naugatuck	lb.	.30 /	.33
Rubber Corp. of America	lb.	.30 /	.44
Sherwin-Williams	lb.	.30 /	.33
DBS (di butyl sebacate),			
comml	lb.	.66 /	.69
Hatco	lb.	.66 /	.685
Monoplex	lb.	.66 /	.675
Naugatuck	lb.	.665 /	.69
DCP (di capryl phthalate),			
comml	lb.	.295 /	.325
Hatco	lb.	.295 /	.325
Monoplex	lb.	.30 /	.315
Ohio-Apex	lb.	.295 /	.325
DDA (di decyl adipate)			
Cabflex	lb.	.425 /	.455
DDP (di decyl phthalate)			
Cabflex	lb.	.305 /	.335
Hatco	lb.	.305 /	.435
Defoamer X-3	lb.	.355	
DIBA (di iso butyl adipate)			
Cabflex	lb.	.4325	.4625
Darex	lb.	.4325 /	.4625
DIDA (di iso decyl adipate)			
Monsanto	lb.	.435 /	.465
DIDP (di iso decyl phthalate)			
Darex	lb.	.32 /	.35
Monsanto	lb.	.32 /	.35
Dielex B	lb.	.06	
Diethylene glycol, comml	lb.	.1475 /	.1750
Wyandotte	lb.	.15 /	.165
Dinopol IDO	lb.	.305 /	.335
DIOA (di iso octyl adipate)			
Cabflex	lb.	.425	.455
Naugatuck	lb.	.435 /	.465
Rubber Corp. of America	lb.	.425 /	.56
DIOP (di iso octyl phthalate),			
comml	lb.	.305 /	.335
Cabflex	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Hatco	lb.	.305 /	.335
Monsanto	lb.	.32 /	.35
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.305 /	.335
Rubber Corp. of America	lb.	.305	.45
Sherwin-Williams	lb.	.32 /	.34
DIOS (di iso octyl sebacate),			
comml	lb.	.61 /	.64
Rubber Corp. of America	lb.	.61 /	.84
DIOZ (di iso octyl azelate)			
Cabflex	lb.	.48	.5075
Dipolymer Oil	gal.	.33 /	.38
Dispersing Oil No. 10	lb.	.06 /	.0625
DNODP (di-n-octyl-n-decyl phthalate)			
Monsanto	lb.	.335 /	.365
DOA (di octyl adipate),			
comml	lb.	.425 /	.455
Cabflex	lb.	.425	.455
Hatco	lb.	.435 /	.465
Monsanto	lb.	.435 /	.465
Naugatuck	lb.	.435 /	.465
Rubber Corp. of America	lb.	.425 /	.56
DOP (di octyl phthalate),			
comml	lb.	.305 /	.335
Cabflex	lb.	.305 /	.335
Darex	lb.	.32 /	.35
Hatco	lb.	.305 /	.335
Monsanto	lb.	.32 /	.35
Naugatuck	lb.	.305 /	.335
Ohio-Apex	lb.	.305 /	.335
Rubber Corp. of America	lb.	.305	.45
Sherwin-Williams	lb.	.32 /	.34
DOS (di octyl sebacate),			
comml	lb.	.61 /	.64
Hatco	lb.	.61 /	.635
Monoplex	lb.	.61 /	.635
Naugatuck	lb.	.615 /	.64
Rubber Corp. of America	lb.	.61 /	.84
Dutch Boy NL-A10 (DBP),			
-A-54	lb.	.30 /	.33
-A20 (DOP), A30 (DIOP)	lb.	.32 /	.35
-C20 (DOS)	lb.	.64 /	.66
-F21	lb.	.395 /	.425

-F31	lb.	$0.46 /	$0.49
-F41	lb.	.49 /	.52
Dutrex 6	lb.	.025 /	.035
Emulphor EL-719	lb.	.52 /	.73
Ethox	lb.	.43 /	.455
Ethylene glycol, comml	lb.	.13 /	.1575
Wyandotte	lb.	.1325 /	.1425
Flexol 3 GH	lb.	.44 /	.46
3 GO	lb.	.53 /	.55
4 GO	lb.	.325 /	.355
426	lb.	.27 /	.30
TOF, A-26	lb.	.435 /	.465
Fortex	lb.	.125 /	.145
G. B. Asphaltic Flux	gal.	.08 /	.14
Naphthenic Neutrals	gal.	.11 /	.18
Process Oil			
Light	lb.	.025 /	.0325
Medium	lb.	.035 /	.0425
Galex W-100	lb.	.155 /	.18
W-100 D	lb.	.1525 /	.1775
Gilsowax B	lb.	.09 /	.11
Good-rite GP-233	lb.	.435 /	.58
GP-261	lb.	.305 /	.455
Harchemex	lb.	.25 /	.34
Harflex 10	lb.	1.25 /	1.335
40	lb.	.66 /	.745
50, 80	lb.	.61 /	.695
60	lb.	.62 /	.705
90	lb.	.88 /	.965
120, 150	lb.	.32 /	.35
140, 160, 180	lb.	.30 /	.33
220	lb.	.435 /	.465
260	lb.	.42 /	.45
280	lb.	.43 /	.46
500	lb.	.315 /	.345
HB-20	lb.	.15 /	.17
-40	lb.	.22 /	.24
Heavy Resin Oil	lb.	.0225 /	.0375
HSC-13	lb.	.27 /	.30
Indoil Compound 51-S	lb.	1.00 /	1.10
Indonex	gal.	.11 /	.19
Kapsol	lb.	.3225 /	.3525
Kenflex A, L	lb.	.26 /	.27
B	lb.	.23 /	.24
N	lb.	.18 /	.19
Kessoflex 103	lb.	.405	
105	lb.	.3325	
106	lb.	.38	
107	lb.	.525	
110	lb.	.24	
111	lb.	.28	
KP-23	lb.	.29 /	.32
-90	lb.	.45 /	.48
-140	lb.	.46 /	.485
-201	lb.	.5825 /	.5925
-220	lb.	.31 /	.34
-555	lb.	.45 /	.475
Kronisol	lb.	.33 /	.355
Kronitex AA, I	lb.	.33 /	.36
Marvinol plasticizers	lb.	.28 /	.8825
Methox	lb.	.385 /	.41
Monoplex S-38	lb.	.215 /	.24
S-71	lb.	.45 /	.475
Morflex	lb.	.25 /	.65
Neoprene Peptizer P.-12	lb.	1.05	
Nevillac	lb.	.39 /	.85
Neville R Resins	lb.	.13 /	.35
Nevinol	lb.	.20	
No. 1-D heavy oil	lb.	.065	
ODA (octyl decyl adipate)			
Cabflex	lb.	.425 /	.455
ODP (octyl decyl phthalate)			
Cabflex	lb.	.305 /	.335
Hatco	lb.	.305 /	.335
Rubber Corp. of America	lb.	.305 /	.45
Ohopex R-9	lb.	.3525 /	.3775
Q-10	lb.	.295 /	.325
Orthonitro benzophenol,			
comml	lb.	.13 /	.15
Monsanto	lb.	.13 /	.15
Palmalene	lb.	.15	
Paradene Resins	lb.	.065 /	.075
Panaflex BN-1	lb.	.185 /	.225
Para Flux, regular	gal.	.10 /	.2125
No. 2016	gal.	.165 /	.24
2332	gal.	.11	
4205	lb.	.1075 /	.2125
Para Lube	lb.	.046 /	.048
Resins	lb.	.04 /	.045
Paraplex 5-B	lb.	.315 /	.3775
AL-111	lb.	.32 /	.3275
G-25	lb.	.79 /	.80
-40	lb.	.51 /	.52
-50	lb.	.4025 /	.4275
-53	lb.	.45 /	.475
-60	lb.	.335 /	.36
-62	lb.	.36 /	.385
RG-7	lb.	.35 /	.355
-8	lb.	.535 /	.5425
-10	lb.	.54 /	.5475
Paradene Resins	lb.	.065 /	.075
Pepton 22	lb.	.79 /	.82
Philrich 5	gal.	.11	
Picco Resins	lb.	.13 /	.185
Aromatic Plasticizers	lb.	.05 /	.065
480 Oilproof Series	lb.	.18 /	.23
Liquid Resin D-165 (Y)	lb.	.06 /	.075
(Z-3)	lb.	.07 /	.085
(Z-6)	lb.	.08 /	.095
S. O. S.	gal.	.29 /	.34
Piccocizers	lb.	.04 /	.055
Piccolastic Resins	lb.	.1855 /	.34
Piccolyte Resins	lb.	.185 /	.25
Piccopale Resins	lb.	.12 /	.135
Piccoumaron Resins	lb.	.07 /	.185
Piccovars	lb.	.145 /	.20
Piccovol	lb.	.025 /	.038
Pictar	gal.	.25 /	.30
Pigmentar	lb.	.0427 /	.0712

Pigmentaroil	lb.	$0.0427 /	$0.0712
Pine Tar, American	lb.	.0438 /	.0712
Sunny South	lb.	.0427 /	.0712
Pine Tar Oil, American	lb.	.0438 /	.0712
Sunny South	lb.	.0427 /	.0712
Pitch, Burgundy			
Sunny South	lb.	.098 /	.1025
Plasticizers			
42	lb.	.34 /	.40
B	lb.	.35 /	.45
DP-520	lb.	.435 /	.455
MT-511	lb.	.535 /	.565
ODN	lb.	.32 /	.37
PX series	lb	.27 /	.69
SC	lb.	.61 /	.69
Plastoflex #3	lb.	.52 /	.57
#520	lb.	.36 /	.435
DBE	lb.	.50 /	.55
MGB	lb.	.32 /	.40
SP-2	lb.	.43 /	.48
VS	lb.	.40 /	.475
Plastogen	lb.	.0775 /	.08
Plastone	lb.	.22 /	.30
Polycizers	lb.	.40 /	.4775
PT67 Light Pine Oil	gal.	.60	
101 Pine Tar Oil	lb.	.0427 /	.0601
Pine Tars	lb.	.0427 /	.0601
R-19, R-21 Resins	lb.	.1075	
Reogen	lb.	.1325 /	.135
Resin C pitch	lb.	.0225 /	.031
R6-3	lb.	.38 /	.40
Resinex 10, 25, 50, 110	lb.	.04 /	.045
70	lb.	.0325 /	.0375
85, 100	lb.	.035 /	.04
115	lb.	.0375 /	.0425
L-2, L-3, L-4, L-5	lb.	.0225 /	.03
Rosin Oil, Sunny South	gal.	.58 /	.875
RPA No. 2	lb.	.78	
3	lb.	.47	
Conc	lb.	.97	
5	lb.	.59	
RSN Flux	gal.	.10 /	.19
Rubber Oil B-5	lb.	.0225 /	.0355
Rubberol	lb.	.2575 /	.2725
Santicizer 1-H	lb.	.50 /	.51
3	lb.	.46 /	.47
8	lb.	.43 /	.44
9	lb.	.39 /	.42
140	lb.	.33 /	.46
141	lb.	.34 /	.37
160	lb.	.25 /	.28
601, 602	lb.	.32	
603	lb.	.27	
B-16	lb.	.4875 /	.4975
E-15	lb.	.5075 /	.5375
M-17	lb.	.4275 /	.4575
Sebacic acid, purified,			
comml	lb.	.64 /	.70
Binney & Smith	lb.	.64 /	.76
Hardesty	lb.	.64 /	.76
C.P.			
Binney & Smith	lb.	.72 /	.84
Hardesty	lb.	.72 /	.84
Sherolatum Petrolatum	lb.	.05 /	.10
Softener #20	gal.	.10 /	.20
Special Rubber Resin 100	lb.	.1675 /	.2175
Staflex AX	lb.	.43	
DBES	lb.	.61 /	.635
Syn-Tac	gal.	.33 /	.35
Synthol	lb.	.2475	
Thiokol TP-90B	lb.	.59	
-95	lb.	.65	
Tricresyl phosphate, comml	lb.	.33 /	.36
Monsanto	lb.	.33 /	.36
Naugatuck	lb.	.33 /	.36
Triphenyl phosphate,			
comml	lb.	.39 /	.40
Monsanto	lb.	.39 /	.40
Turgum S	lb.	.1075 /	.1175
Tysonite	lb.	.24 /	.2475
United	gal.	.69 /	1.20
X-1 Resinous Oil	lb.	.021 /	.0275

Reclaiming Oils

Acintol C, P	lb.	.02 /	.03
Bardol, 639	lb.	.0275 /	.0375
B	lb.	.0625 /	.065
BRH 2	lb.	.0213 /	.0351
BRT 3	lb.	.018 /	.0265
4	lb.	.025 /	.026
7	lb.	.03 /	.031
BRV	lb.	.0475 /	.0565
Burco-RA	lb.	.053 /	.0805
BWH-1	lb.	.16 /	.18
Dipolymer Oil	gal.	.33 /	.43
Dispersing Oil No. 10	lb.	.06 /	.0625
G. B. Oils	gal.	.10 /	.24
Heavy Resin Oil	lb.	.0225 /	.0375
LX-777	gal.	.23 /	.33
No. 3186	gal.	.28 /	.295
Picco 6535	gal.	.25 /	.30
C-33	gal.	.215 /	.315
-42	gal.	.23 /	.33
D-4	gal.	.27 /	.37
E-5	gal.	.25 /	.35
Q-Oil	gal.	.286 /	.36
PT 67	gal.	.60	
101 Pine Tar Oil	lb.	.0427 /	.0601
150 Pine Solvent	gal.	.44	
Reclaiming Oil #3186	gal.	.28 /	.385
-G	gal.	.25 /	.365
4039-M	gal.	.3275 /	.3975
-Y	gal.	.30 /	.37
RR-10	lb.	.36	
S. R. O.	lb.	.015 /	.0225
X-1 Resinous Oil	lb.	.021 /	.03

CLASSIFIED ADVERTISEMENTS

Continued

SITUATIONS WANTED (Continued)

CHEMICAL TEAM, Ph.D. AND B.S., 35 YEARS' COMBINED EXperience, imaginative, strong adjunct forward programs, rubbers, plastics, coatings, additives. Address Box No. 1673, care of RUBBER WORLD.

PRODUCT DEVELOPMENT CHEMIST—GRAD. CHEM. ENGR. —12 yrs.' Exp. Vinyl-calender-solution-plastisol-latex. Latex paints and coatings. Nat. and syn. rubber pressure-sens. adhesives and tapes. Release coatings, heatseals. Presently employed chief chemist small plant—lacks sales and capital. Interested in opportunity which takes advantage of proven development ability. Capable of handling consultant position. Metro. New York area only. Address Box No. 1682, care of RUBBER WORLD.

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FARREL 16" x 48" AND 15" X 36", 2-ROLL RUBBER MILLS, AND sizes up to 84". New and used lab. 6" x 12" & 6" x 16" mills and calenders. American Tool 300-gallon Churns. Extruders 1" to 6". Baker-Perkins Jacketed Mixers 100, 50, and 9 gals. HPM 200-ton Hydr. Press 30" x 48" platens, Brunswick 200-ton 21" x 21" platens. 150-ton, 20" x 20" platens. Large stock of hydraulic presses 12" x 12" to 48" x 48" platens. Hydraulic pumps and Accumulators. Rotary cutters. Stokes Molding Presses. Single Punch & Rotary Preform Machines, Banbury Mixers, Crushers, Kux 2½" dia. Preform Machine, Churns, Bale Cutters, etc. SEND FOR SPECIAL BULLETIN. WE BUY YOUR SURPLUS MACHINERY. STEIN EQUIPMENT CO., 107—8th St., Brooklyn 15, N. Y. Sterling 8-1944.

ATLAS HYDRAULICS, INC.
Hydraulic Presses 12" x 12" and 14" x 14" for Laboratory or Production. Inquiries invited for special needs. 3576 Ruth St., Philadelphia 34, Penna.

Reinforcers, Other Than Carbon Black

American Resinous Chemical			
978-42B	lb.	$0.18 /	$0.19
1073-18B	lb.	.135 /	.145
1294-36B	lb.	.115 /	.125
1301-12B	lb.	.15 /	.16
Angelo Shellacs	lb.	.485 /	.7325
BRC 20	lb.	.15 /	.175
22	lb.	.025 /	.0275
30	lb.	.0125/	.021
521	lb.	.019 /	.02
Bunarex Resins	lb.	.065 /	.1225
Cab-o-sil	lb.	.68 /	.75
Calcene NC	ton	72.50 /	92.50
TM	ton	75.00 /	95.00
Calco S. A.	lb.	.85 /	.88
Clays			
Aiken	ton	14.00	
Buca	ton	45.00	
Burgess HC-75	ton	12.00 /	30.00
HC-80	ton	14.00 /	32.00
Iceberg	ton	50.00 /	60.00
Pigment No. 20	ton	35.00 /	60.00
30	ton	37.00 /	60.00
Catalpo	ton	35.00	
Crown	ton	14.00 /	33.00
Dixie	ton	14.00	
Franklin	ton	13.50 /	35.25
L. G. B.	ton	17.00	
Paragon	ton	13.50 /	33.00
Pigment No. 33	ton	37.00	
Recco	ton	14.00	
Suprex	ton	14.00 /	33.50
Swanee	ton	12.50	
Whitetex	ton	50.00	
Windsor	ton	14.00 /	30.00
Witco No. 1	ton	14.00 /	30.00
No. 2	ton	13.50 /	30.00
Clearcarb	lb.	.1175/	.1225
Cumar Resins	lb.	.065 /	.17
Darex Resins	lb.	.42 /	.49
Diatomaceous silica	ton	32.00 /	48.00
Good-rite Resin 50	lb.	.39 /	.41
K Series Polymers	lb.	.15 /	.37
Hi-Sil 101	lb.	.10 /	.115
202	lb.	.11 /	.125
Indulins	lb.	.06 /	.08
Kralac A-EP	lb.	.43 /	.54
Laminar	ton	30.00	
Magnesium Carbonate, Merck	lb.	.105 /	.12
Marbon Resins	lb.	.39 /	.46
Multifex	ton	140.00	/ 155.00
MM	ton	110.00	/ 125.00
Super	ton	160.00	/ 175.00
Neville Resins			
465	lb.	.07 /	.0825
G	lb.	.13	
LX-509	lb.	.35	
Nebony	lb.	.04 /	.0575
Paradene	lb.	.065 /	.075
R	lb.	.13 /	.18
Para Resins 2457, 2718	lb.	.04 /	.45
Parapol S-Polymers	lb.	.44	
Picco Resins	lb.	.13 /	.185
Piccolyte Resins	lb.	.185 /	.25
Piccoumaron Resins	lb.	.07 /	.185
Piccovars	lb.	.145 /	.20
Pliolite NR types	lb.	.98 /	1.33
S-3, -6	lb.	.42 /	.49
-6B	lb.	.39 /	.46
Purecal M	ton	56.75 /	71.75
SC, T	ton	110.00	/ 125.00
U	ton	120.00	/ 135.00
R-B-H 510	lb.	.15 /	.22
Resinex	lb.	.0325/	.0425
Rubber Resin LM-4	lb.	.28 /	.35
Silene EF	ton	120.00	/ 140.00
Silvacons	ton	55.00 /	85.00
Witcarb R	ton	105.00	/ 120.00
-12	ton	45.00 /	66.00
Zeolex 23	ton	120.00	/ 140.00
Zinc oxide, commercial†	lb.	.135 /	.1775

Retarders

Delac J	lb.	.55 /	.60
E-S-E-N	lb.	.35 /	.37
Good-rite Vultrol	lb.	.62 /	.66
R-17 Resin	lb.	.1075/	.36
Retarder ASA	lb.	.57	
PD	lb.	.35 /	.37
W	lb.	.45	
Retardex	lb.	.47 /	.50
Thionex	lb.	1.14	

Solvents

Bondogen	lb.	.55 /	.60
Butyrolactone	lb.	.60 /	.65
Cosol #1	gal.	.37 /	.43
#2	gal.	.42 /	.48
Dichloro Pentanes	lb.	.04 /	.07
Dipentene DD	gal.	.265 /	.57
Ethylene dichloride, comml.	lb.	.09 /	.1225
Hi-Flash 2-50-W	gal.	.41	
Pale yellow	gal.	.39	
LX-572	gal.	.27 /	.32
-748	gal.	.16 /	.23
n-Methyl-2-pyrrolidone	lb.	.75 /	.80
Neville Nos. 100, 104	gal.	.52 /	.60
106	gal.	.38 /	.46
Nevsol B	gal.	.20 /	.30
H, 200	gal.	.19 /	.29
HF, T, 30	gal.	.24 /	.34
Penetrell	gal.	$0.265 /	$0.57
Picco Hi-Solv Solvents	gal.	.19 /	.45
Pine Oil DD	lb.	.1125/	.1355
PT 150 Pine Solvent	gal.	.44	
Skellysolve-E	gal.	.153	
-H	gal.	.133	
-R, -V	gal.	.109	
-S	gal.	.099	
Stauffer Carbon Disulphide	lb.	.0525/	.085
Tetrachloride	lb.	.0825/	.475

Synthetic Rubbers and Latices

PRIVATELY PRODUCED

Butaprene Latex (dry wt.)			
NL types	lb.	.47 /	.52
NXM types	lb.	.55 /	.60
Butaprene NAA	lb.	.54 /	.55
NF	lb.	.49 /	.50
NL	lb.	.50 /	.51
NXM	lb.	.58 /	.59
Chemigum 30N4NS, 50N4NS	lb.	.50 /	.52
N1NS	lb.	.64 /	.66
N3NS	lb.	.58 /	.60
N6, N7	lb.	.50 /	.52
Chemigum Latex (dry wt.)			
101 types	lb.	.35 /	.42
200, 245 types	lb.	.47 /	.55
235 types	lb.	.55 /	.63
Hycar 1001, 1041	lb.	.53 /	.59
1002, 1042, 1043	lb.	.50 /	.51
1014, 1312	lb.	.60 /	.61
1411	lb.	.62 /	.63
1432	lb.	.59 /	.60
1441	lb.	.64 /	.65
Hycar Latex (dry wt.)			
1512, 1552, 1562, 1577	lb.	.46 /	.52
1551, 1561	lb.	.54 /	.60
1571	lb.	.59 /	.65
1572	lb.	.51 /	.57
Hypalon	lb.	.95 /	1.01
Indulin-70-GR-S	lb.	.22 /	.23
Neoprene Latex (dry wt.)			
Type 571, 842-A	lb.	.37 /	.48
572	lb.	.39 /	.50
601-A	lb.	.40 /	.51
735, 736	lb.	.38 /	.49
950	lb.	.47 /	.58
Neoprene Type AC, CG	lb.	.55 /	.58
GN, GN-A	lb.	.41 /	.44
GRT, S	lb.	.42 /	.45
KNR	lb.	.75 /	.78
Q	lb.	1.00 /	1.03
W, WHV	lb.	.39	
WRT	lb.	.45 /	.48
Paracril 18-80	lb.	.60 /	.61
AJ	lb.	.485 /	.495
B, BJ	lb.	.50 /	.51
BV	lb.	.51 /	.52
C	lb.	.58 /	.59
CS, CV	lb.	.59 /	.60
Paraplex X-100	lb.	1.00	
Silastic	lb.	2.30 /	4.05
Thiokol LP-2, -3, -32, -33	lb.	.96	
-8, -38	lb.	1.25	
PR-1	lb.	.95	
Type A	lb.	.47	
FA	lb.	.69	
ST	lb.	1.00	
Thiokol Latex (dry wt.)			
Type MF	lb.	.85	
MX	lb.	.70	
WD-2	lb.	.92	
-5	lb.	.95	
-6, -7	lb.	.70	
Vistanex types	lb.	.45	

GOVERNMENT

Hot GR-S Non-Pigmented

Staining		
1000, 1004, 1007	lb.	.23
1002, 1015, 1016, 1023	lb.	.2325
1021	lb.	.24
Slightly Staining		
1001	lb.	.23
1014	lb.	.235
Non-Staining		
1006, 1010, 1012, 1013	lb.	.23
1009, 1019	lb.	.2325
1018, 1022	lb.	.235

Hot GR-S Black Masterbatches

Staining		
1100	lb.	.185
Slightly Staining		
1104	lb.	.18

Cold GR-S Non-Pigmented

Staining		
1500, 1505	lb.	.23
Slightly Staining		
1501	lb.	.23
Non-Staining		
1502	lb.	.23
1503, 1504	lb.	.2325

Cold GR-S Black Masterbatches

Staining		
1600, 1601, 1602	lb.	.185

Cold GR-S Oil Masterbatches

100 parts GR-S, 25 parts oil		
1703	lb.	$0.195
1705, 1706	lb.	.1925
100 parts GR-S, 37.5 parts oil		
1707, 1708	lb.	.18
1709, 1710, 1711, 1712	lb.	.1775

Cold GR-S Oil Black Masterbatches

Staining		
1801	lb.	.17

GR-I Polymers

GR-I, 15,* 17,* 18,* 25, 35, 50*	lb.	.23

Latices†

Hot latices		
2006	lb.	.215
2000, 2001	lb.	.2275
2004	lb.	.26
2003	lb.	.265
2002	lb.	.255
2005	lb.	.28
Cold latices		
2101	lb.	.225
2102, 2104, 2105	lb.	.26
2103, X-767	lb.	.2675
2106	lb.	.255
X-765	lb.	.235

Tackifiers

American Resinous Chemical			
A25, A26, 716-30	lb.	$0.18 /	.19
555-40R	lb.	.185 /	.205
620-32B	lb.	.20 /	.21
716-35	lb.	.17 /	.18
1041-21	lb.	.165 /	.175
Acintol R	lb.	.065 /	.07
Bardol, 639	lb.	.0275/	.0375
BRH 2	lb.	.0213/	.0351
Bunarex Resins	lb.	.065 /	.1225
Chlorowax 70	lb.	.18 /	.24
Contogums	lb.	.0875/	.11
Cumar Resins	lb.	.065 /	.17
Galex W-100	lb.	.155 /	.17
W-100D	lb.	.1525/	.1675
Indopol H-35	gal.	.65 /	.81
H-50	gal.	.70 /	.86
H-100	gal.	.85 /	1.05
H-300	gal.	1.00 /	1.21
L-10	gal.	.40 /	.56
L-50	gal.	.45 /	.61
L-100	gal.	.55 /	.71
Kenflex resins	lb.	.18 /	.27
Koresin	lb.	.90 /	1.10
Natac	lb.	.12 /	.13
Nevindene	lb.	.15 /	.18
Picco Resins	lb.	.13 /	.185
Piccolastic Resins	lb.	.1855/	.34
Piccolyte Resins	lb.	.185 /	.25
Piccopale Resins	lb.	.12 /	.135
Piccoumaron Resins	lb.	.07 /	.185
R-B-H 510	lb.	.15 /	.22
Roelflex 1118A	lb.	.39	
Synthetic 100	lb.	.41	
Synthol	lb.	.2475/	.2625
United	gal.	.69 /	1.20

Vulcanizing Agents

Dibenzo G-M-F	lb.	2.60	
G-M-F #113, #117	lb.	.90	
Ko-Blend I, S	lb.	.385	
Litharge (*See Accelerator-Activators, Inorganic*)			
Magnesium oxide	lb.	.2525/	.38
Merck, Light Calcined	lb.	.2525/	.26
Extra Light Calcined	lb.	.2925/	.30
Red lead (*See Accelerator-Activators, Inorganic*)			
Sufsal R	lb.	1.50	
Sulfur flour, comml.	100 lbs.	2.30 /	3.05
Aero	100 lbs.	2.15 /	7.50
Crystex	lb.	.195 /	.23
Insoluble 60	lb.	.125 /	.13
Rubbermakers	100 lbs.	2.40 /	4.30
Stauffer	lb.	.024 /	.0515
Telloy	lb.	2.50	
Vandex	lb.	6.00	
Vultac No. 2	lb.	.47 /	.755
3	lb.	.51 /	.795
White lead silicate (*See Accelerator-Activators, Inorganic*)			

* Also available packed in coated cartons at the same price.

† These prices are for latex in tank-car quantities 10,000 gallons).

Reprints of "The Shrinkage of Mold Cured Elastomer Compositions," by A. E. Juve and J. R. Beatty, from our October, 1954, issue, are available at 10¢ each.

CLASSIFIED ADVERTISEMENTS

Continued

MACHINERY & SUPPLIES FOR SALE (Continued)

FOR SALE: 1—NATIONAL-ERIE 8½″ STRAINER; 1 ADAMSON 20″ x 16″ two-opening press, 14″ ram; 1—Farrel 18″ x 50″ 3-roll vertical calender; 1—Thropp 6″ x 16″ lab mill; also mixers, vulcanizers, cutters, etc. CHEMICAL & PROCESS MACHINERY CORP., 146 Grand Street, New York 13, N. Y.

FOR SALE: NEW—"ROSS"—SIZE 860—TYPE BCP HEAT EXchangers—single pass—83.5 Sq. Ft. Heat Transfer Surface. All Metal Construction. 8-⅛″ Diameter x 6′2-⅞″ lg. Overall, Price: $250.00 each, f. o. b. Phila., Pa. Full Details and Drawing available upon request. J. A. DOUGHERTY, P. O Box 90, Bala-Cynwyd, Pa.

FOR SALE: 1—FARREL-BIRMINGHAM 32″ x 92″ INVERTED-L, 4-roll calender, reduction drive, D. C. varispeed motor; 1—Royle #4 extruder, motor driven; 4—Wymac 150-ton molding presses, 16″ x 16″, electrically heated platen; 1—6″ x 12″ laboratory mill, m.d.; 1—Ball & Jewell #2 rotary cutter. 15-HP motor; 3—#28 Devine vacuum shelf dryers, 19-59″ x 78″ shelves, complete; 1—Farrel-Birmingham 20″ x 22″ x 60″ mill, top cap frame, Falk reduction drive, 100-HP motor; 2—Farrel-Birmingham 16″ x 42″ mills with reduction drive and 100-HP motor; 1—Read 2,000-lb. all steel double-ribbon horizontal mixer; 3—Colton #5½ single punch tablet machines, m.d.; also other sizes Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. WANTED: Your Surplus Rubber Machinery. CONSOLIDATED PRODUCTS COMPANY, INC., 64 Bloomfield St., Hoboken, N. J.; HOboken 3-4425; N. Y. Phone: BArclay 7-0600.

FOR SALE: NEW "STRUTHERS-WELLS" VERTICAL HIGH-pressure feedwater heaters. 6 Pass—206 Sq. Ft. Surface. Shell Diameter 18″ x 7′10½″ High. Price: $550.00 each. Drawing and Operating Data available upon request. J. A. DOUGHERTY, P. O. Box 90, Bala-Cynwyd, Pa.

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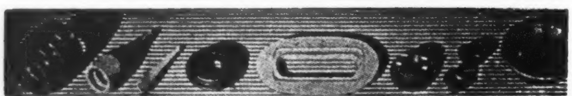

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CLASSIFIED ADVERTISEMENTS
Continued

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INTERESTED IN PURCHASING ODD LOTS OF RESIN AND OFF resin. Any quantity; large quantities preferred. Reply in detail sending samples and identify material offered. Address Box No. 1678, care of RUBBER WORLD.

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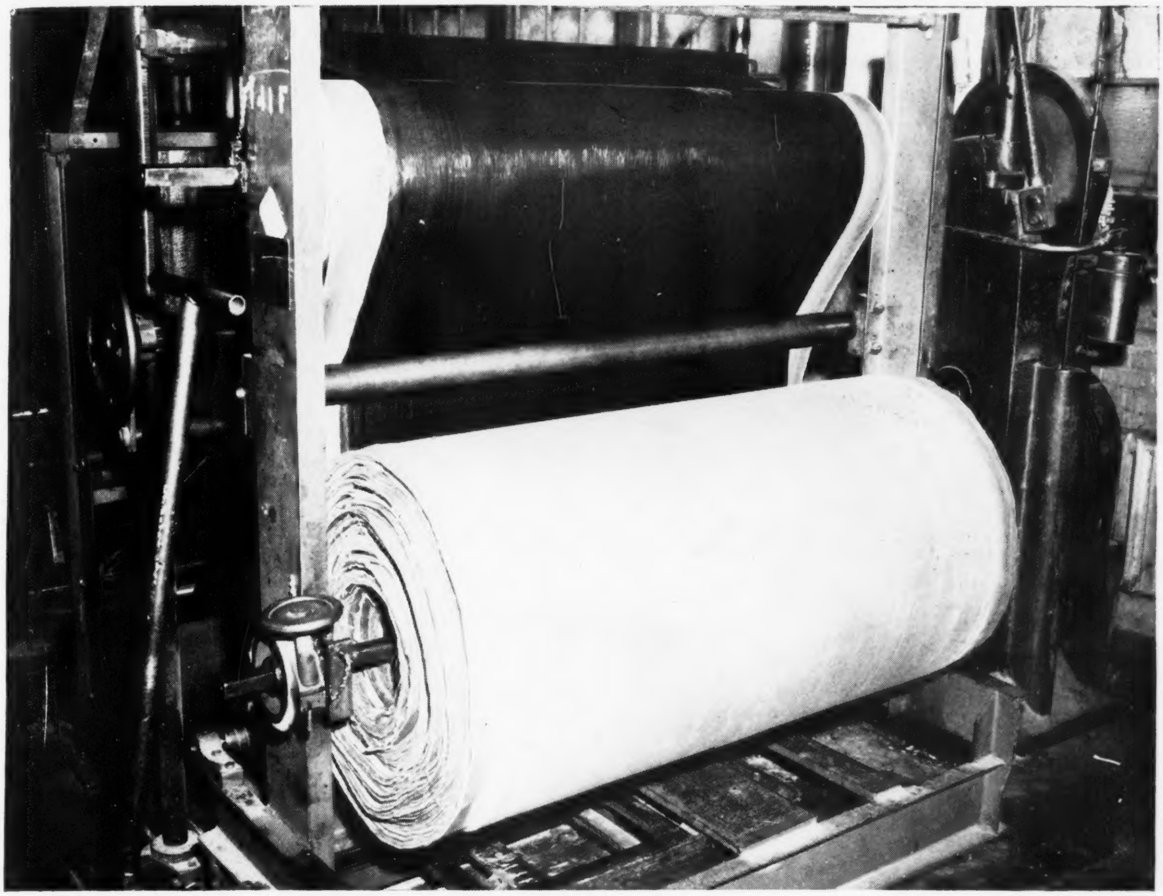

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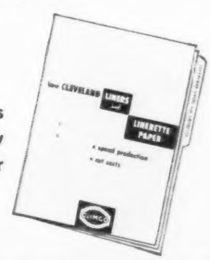

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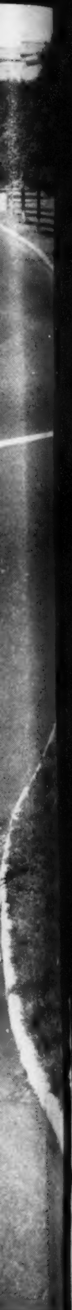

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